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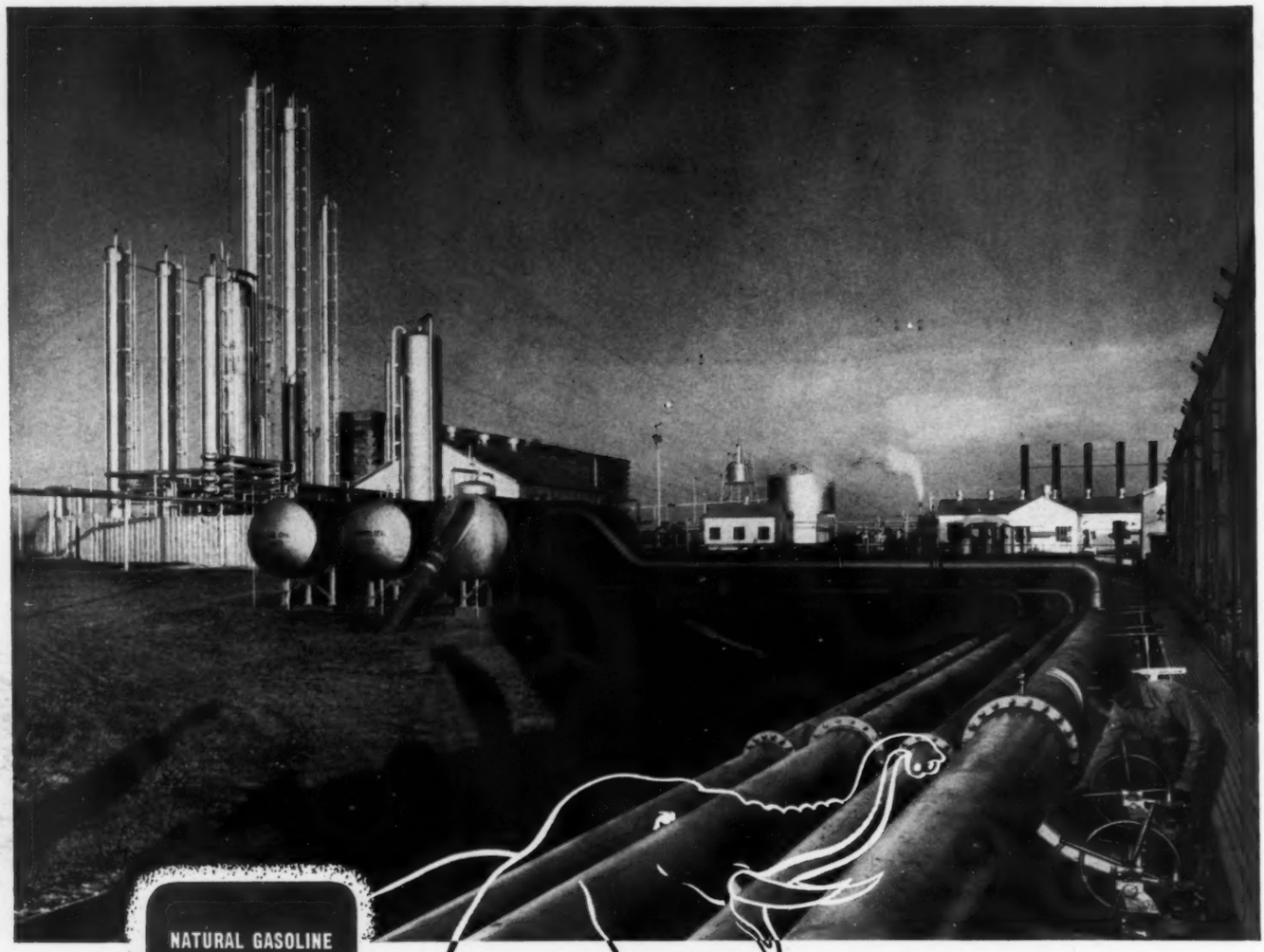

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Crude Oil, Natural Gasoline and Liquefied Petroleum Products

WORLD PETROLEUM

Founded by Russell Palmer

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E. W. Mayo
Editor

J. C. Chatfield
Managing Editor

Richard Sala
Art Director

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CONTENTS

VOLUME 19 JANUARY, 1948 NUMBER 1

Supply and Demand in 1948 41

World Production Rose 9 Percent in 1947 42

Improved Steel Outlook for 1948 45

Mexico's Program of Oil Expansion 48

U. S. Synthetic Rubber Policy 50

German Oil Industry Makes Slow Recovery 52

Surface Active Agents from Petroleum 56

Petroleum's Relationship to National Security 59

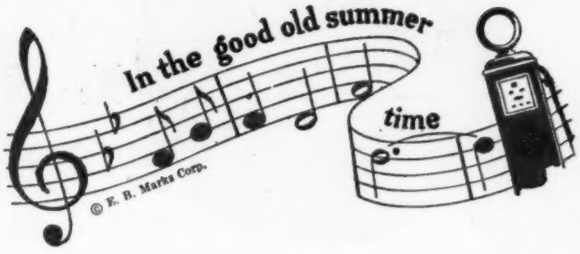
British Petroleum Equipment Exports Increase 62

Restored State Technique Reproduces Reservoir Condition 64

International Notes 66

Oil Company Changes 68

Swelling Demand Challenges Oil Industry 70

THIS MONTH'S COVER. Town of Masjid-i-Sulaiman in the heart of the Masjid-i-Sulaiman field in Iran. Many of the employees of Anglo Iranian Oil Co., Inc., who operate this field live here in the mountainous region some 150 miles north of Abadan. The Masjid-i-Sulaiman is the discovery field in Iran, the first well having been drilled in 1908. It produces currently about 60,000 barrels of oil daily, output being limited because of limited transportation facilities. Color photographs shown on the cover were taken by Raymond Wilson for Anglo Iranian and are reproduced here through the courtesy of the editors of the Naft Magazine, published by the company for its employees.

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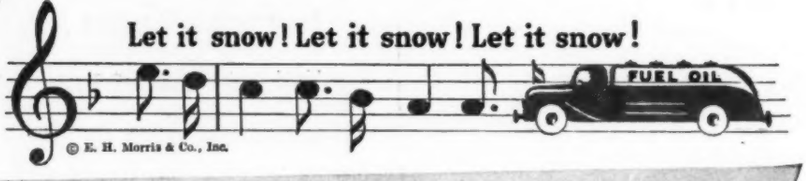

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EDITORIAL

SUPPLY AND DEMAND IN 1948

WORLD demand for petroleum products in 1947 not only lived up to early expectations of most industry estimators but far exceeded them. While world production increased over 1946 by nine percent of 685,000 barrels daily, and in the United States by 6.9 percent or roundly 330,000 barrels daily, the rise in demand for certain petroleum products proceeded at a still higher rate. Most remarkable has been the growth in the use of light distillates—diesel oil, kerosene and fuel oil for heating. Statistics of their consumption on a world-wide basis are not available, but in the United States, based on reports for the first three-quarters of the year, the growth in demand has been on the order of 14 percent, and this probably is a fair average for the world as a whole. There has been a decline in crude stocks, most noticeably during the second half of the year, but no real shortage of crude supplies.

In one respect the industry has experienced a new sensation during the year just completed. At times and in certain places temporary difficulty has been experienced in providing retail distributors with sufficient supplies to meet the full demands of their customers. Oil men are familiar with conditions under which supplies have been plethoric, but the past year has been the first in a quarter century when the problem of maintaining adequate working stocks has assumed proportions of consequence. At the height of the motoring season it became necessary in some few areas to allocate supplies to local distributors. The rapid upswing in the demand for distillate fuel oils caused American refiners to feel some concern over a possible winter shortage in domestic heating oils and led to the promulgation of warnings to householders to conserve liquid fuel.

Such an unusual state of affairs in peacetime naturally attracted wide attention. Reports that the United States was running out of oil and that a general shortage was impending passed from one person to another. Military authorities became alarmed at the reluctance of refiners to bid on their requirements which now are seven times as great as in the period immediately before the late war. Congress, always alert to any development affecting oil, began a series of investigations, and proposals for federal control of prices and distribution began to be heard around Washington.

As leaders of the oil industry and others familiar with conditions have explained, the situation is not one of a shortage of oil in sight but is due to inadequate facilities for moving it in greatly increased quantity from field to refinery and from refinery to market place. While the number of wells completed during the year established a new high record, the tonnage obtainable of casing and drill pipe was not enough in the opinion of producers to maintain a normal volume of reserves in relation to mounting consumption. Thousands of miles of pipe for the construction of lines for the conveyance of crude and products could not be built because steel mills could not deliver the necessary pipe. Enlargement of plants for which a billion dollars or more had been earmarked had to be deferred because steel and equipment could not be delivered. The industry's greatest problem has been a problem of steel.

For members of the oil industry as for the users of its products, the question of utmost importance now is: What of 1948? The answer cannot be made in too positive terms, but from the best information available the outlook is optimistic. There is no reason to expect any abatement in the growth of demand. Another 10 percent advance would require an increase of 750,000 barrels in daily production, bringing the total up to roundly nine million barrels. In the way of increased production it appears reasonable to expect a rise of 300,000 barrels daily in the United States, another 100,000 to 150,000 barrels in South America, 150,000 to 200,000 in the Middle East and at least 100,000 in the Far East. If these estimates hold good, the relationship between supply and demand should not be materially changed.

Scarcity of materials of construction is still to be anticipated. The steel situation should improve with the enlargement of plant capacity, both in the United States and elsewhere, and with a leveling off of demand from certain lines of industry which is beginning to appear. Transportation is the most threatening bottleneck, but with the effort now under way to put more tankers into operation and the certainty that some at least of the many pipelines projected will come into service before the end of the year, some relief in this direction may confidently be looked for. With construction now under way and with the return to full operation of a number of refineries in the Eastern Hemisphere, a rise of 400,000 to 500,000 barrels daily in refinery capacity appears to be reasonably in sight.

On the whole the members of the oil industry can look forward to a year of great activity in 1948 and can approach it with confidence in their ability to meet all its demands, providing undue governmental interference can be avoided.

WORLD PRODUCTION ROSE 9 PERCENT IN 1947

DESPITE shortages of drilling equipment, world production of crude oil increased nine percent to 8,224,800 barrels daily in 1947. This vast river of oil was refined and delivered to eager consumers in the face of many difficulties. Except in isolated instances, demand was met without causing hardship to customers.

It was touch-and-go a number of times because the industry had no surplus of anything. Before the war there was surplus crude available for production as required, surplus transportation facilities and surplus refining capacity. Then it was easy to have enough of the right commodities at the right places and at the right time. But, in 1947, without a surplus of anything and with world demand 43 percent higher than in 1939, the industry qualified for membership in the Society of Amateur Magicians.

1948 probably will be a little easier, but not enough easier to permit members of the industry to do any loafing. Careful estimates by many authorities indicate that world production of crude will increase 10 percent in 1948 to 9,073,500 barrels daily. This will be 59 percent higher than 1939, the last full year of world peace. This should be adequate substantially to meet demand.

Supply lines will be shortened in many instances in 1948 which should tend to alleviate the shipping deficit. Crude production in Indonesia will probably increase about 200 percent enabling the industry to meet a good part of the demands of the Orient with much shorter tanker hauls. An increase of 30 percent in crude production in the Middle East also will help shipping. Current indications are that tanker shortages will be helped also by putting back into service the remainder of the government pool Liberty ships, even though they are not economic in operation when compared with tankers currently being built.

There will be no surplus of refining capacity, but it is believed that capacity will be adequate if there is no major disaster and in 1947 turnaround techniques are continued to get maximum calendar-day throughput. Refining capacity in the United States on Dec. 31, 1947 is estimated at 5.7 million barrels compared with 5,566,482 barrels a year earlier and 4,721,213 barrels on Dec. 31, 1939. By the end of 1948 capacity will be up to nearly six million barrels in the United States. Restoration of refineries in Indonesia and Europe will be a great help.

Although 1948 producing, transporting and refining facilities now appear adequate for the job they have to perform, there will be no substantial surplus of anything. The "good old days" will not be back before 1950 or 1951. By that time salesmen may have to search for orders again instead of hiding out from the customers.

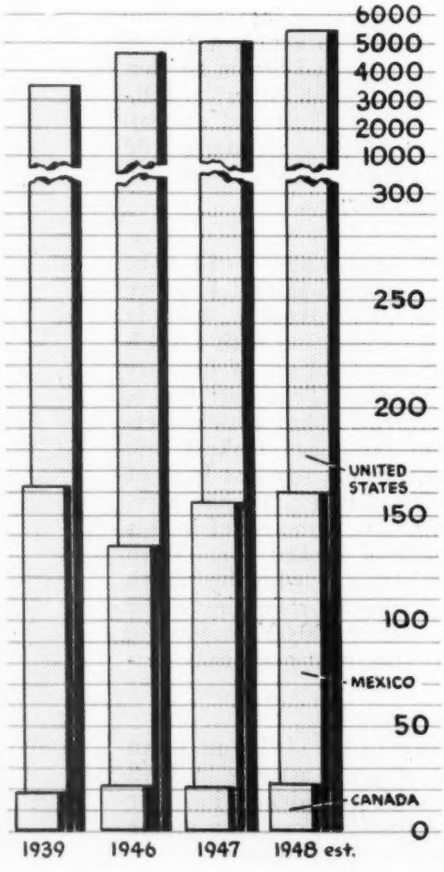
Out of the increase in daily average crude production of 684,900 barrels in 1947, the western hemisphere provided 480,300 barrels and the eastern hemisphere 204,600 barrels. United States production increased 329,000 barrels on a daily average basis, and Venezuela 123,000 barrels. These two contributed all except 28,000 barrels of the increase in the western hemisphere.

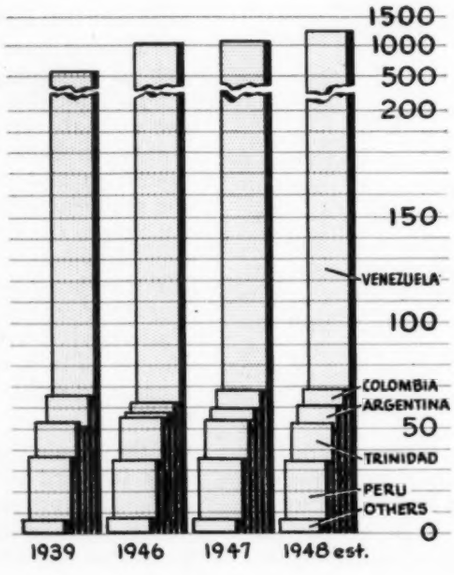
In the eastern hemisphere the Middle East contributed an increase of 123,400 barrels daily average, Soviet Russia 54,000 barrels and Indonesia 32,600 barrels. European production decreased about 7,500 barrels daily average. Best available estimates are that Russian production increased 12 percent in 1947 to 505,000 barrels daily. This still is below the 1939 average of 592,000 barrels. It is believed that Russia may be able to show an increase of 15 percent in 1948, bringing its output up to 580,000 barrels per day, and that the 1951 goal of 670,000 barrels daily proposed under the present five-year plan will not be difficult of accomplishment. In this the Russians are doing a far better job than they did before the war. In neither of the two previous five-year plans was the country able to come anywhere close to the goals set by the state planners. Time after time the industry's quotas were whittled down, and each time even the reduced quantities were not produced, this in spite of the fact that the USSR is thought to have the largest reserves of any country in the world, as much as 7,000 million barrels according to some estimates.

Russia's current program is far more realistic than it was before the war. The goal for 1937, for example, was set by Moscow at 1,300,000 barrels daily, and the state-managed industry was able to turn out only 540,000 barrels daily. By 1939 production was only up to 592,000 barrels and in 1940 to 600,000 barrels daily. Now Russia has a number of new fields to draw on and the quotas are not fantastic.

Most amazing producing areas in the world today are, of course, the fields adjacent to the Persian Gulf. In 1947 there were 21 new wells drilled in Saudi Arabia bringing the total to 67. Production of the country increased 79,800 barrels daily average. This may be compared with the increase of 321,000 barrels in daily average production in the United States, which was achieved by drilling 34,000 wells. One new field was discovered in Saudi Arabia during the year, Buqqua, which is 20 miles northeast of Abqaik. At the end of the year two wells had been completed in the new field and one additional well was drilling. Little is known of its potentialities.

In 1946 Saudi Arabia produced an average of 245,000 barrels of crude daily, and year-end production was 293,000 barrels per day. Estimated output in 1948 is 345,000 barrels daily and year-end production 367,500 barrels. Production is dependent on transportation and refining facilities rather than on drilling.





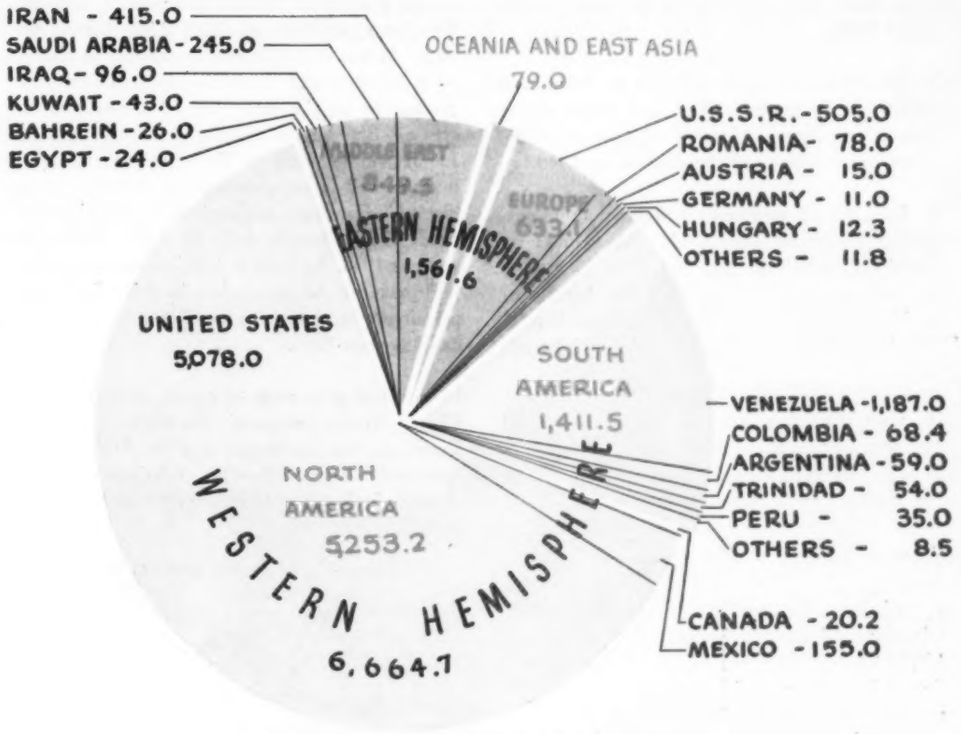
Left: Production of North American fields in 1947 compared with previous years and estimated 1948 production. Below: South America. All figures in thousands of barrels daily.

The area being developed most rapidly at present is Kuwait. Production began there about mid-year in 1946 and by the end of the year had totaled 5,990,000 barrels from eight wells. This was an average for the year of 16,200 barrels daily, but for the period of actual production the average was 27,500 barrels daily.

In 1947 the operators completed four wells and brought average production up to 43,000 barrels. At present five rigs are running, and this will be increased to 12 during 1948 if equipment can be delivered. Estimated production for 1948 is 140,000 barrels daily average, more than three times the 1947 record.

Other areas in the Middle East showed less spectacular changes in 1947 and are not expected to change greatly in 1948. Iran and Iraq production depends on pipeline transportation and showed little change in 1947. In 1948 new line capacity will permit an increase in Iran to about 475,000 barrels daily from 415,000 in 1947. Bahrein production has been rising gradually in 1947, reaching 28,000 barrels daily at the year end, a level which is expected to continue in 1948 without much change. Last year 11 producing wells were drilled. In 1948 a deep test is projected.

Rehabilitation of the industry in Indonesia has proceeded rapidly during the past year, and the trend is expected to continue in 1948. Production in British Borneo was resumed on a small scale in 1946, and last year's production was higher than prewar, averaging 30,000 barrels daily. It is expected to increase to 40,000 barrels in 1948, double the 1939 rate. Dutch Borneo production at Tarakan was resumed on a small scale in October, 1946, and by January had reached 4,000 barrels per day. Active drilling of new wells as well as reconditioning of old wells was undertaken, and by October 1947 there were 313 wells producing nearly 5,000 barrels of crude daily. In 1948 production is expected to average 6,500 barrels daily. At Balikpapan the refinery has been restored to a capacity of about 7,000 barrels per day and will be raised to prewar capacity of 25,000 barrels in 1948. Production of the Louise field was restored to 7,000 barrels daily by September, 1947, Sambodja to 3,800 barrels and Tandjung to seven barrels.

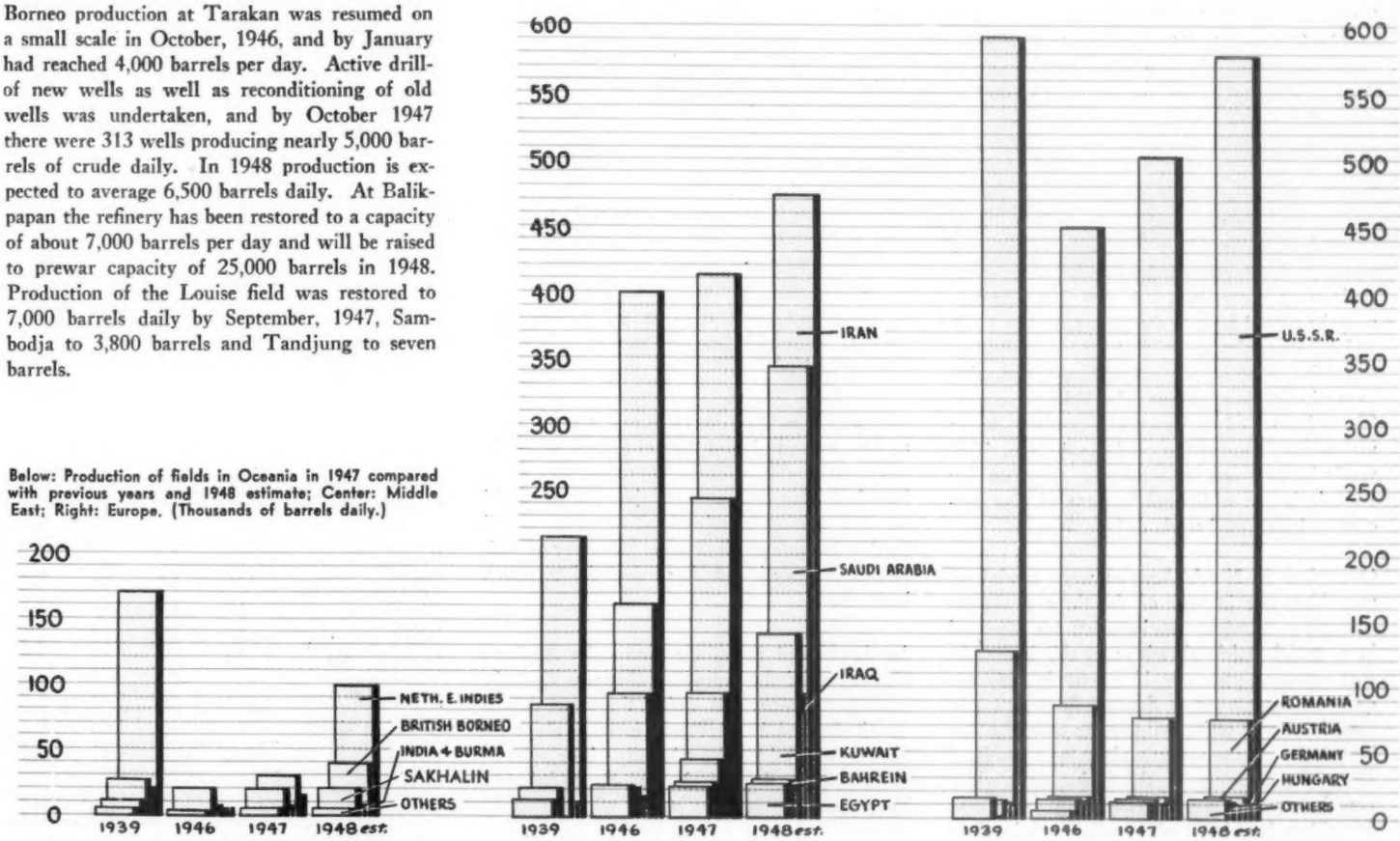


Estimated World Production in 1947 by major areas.

On Sumatra the Royal Dutch Shell began work on its Pladju refinery on October. 1, 1946, and within a year had an operative capacity of 30,000 barrels. Plans were to have the plant up to a capacity of 45,000 barrels by December, 1947, but information is not at hand as this is being written as to whether this program was fulfilled in all details.

Work in the Pladju field was not possible until last August, but by December production was up to about 25,000 barrels daily, and plans are

Below: Production of fields in Oceania in 1947 compared with previous years and 1948 estimate; Center: Middle East; Right: Europe. (Thousands of barrels daily.)



to increase this to 65,000 barrels daily by the end of 1948.

Standard-Vacuum began repairing its Palembang refinery in September, 1948, and began operations a year later. Current capacity is 21,000 barrels daily which will be doubled in 1948.

In Java the oil companies still are not in possession of some of their fields. Work was resumed at Krukah in January, 1946, and there are now 38 wells producing 1,000 barrels of oil daily. Refineries at Wonokromo and Bendul have been rebuilt to a capacity of 1,400 barrels daily.

Production in Indonesia as a whole averaged 34,000 barrels daily in 1947 and is expected to average 140,000 barrels in 1948 compared with 190,000 barrels in 1939.

European production continued to fall in 1947, except in the fields of Soviet Russia. Output of Romanian wells averaged 78,000 barrels compared with 86,200 barrels in 1946 and 128,500 barrels daily in 1939. Equipment and financial problems of oil companies have been insurmountable. Production of middle European countries has been steady. Only the Netherlands has been able to increase output. Here production rose from 1,200 barrels daily in 1946 to 4,000 barrels in 1947 and the 1948 average is expected to reach 6,000 barrels.

Production in South America and the Caribbean increased 10 percent in 1947 to 1,411,500 barrels daily. Virtually all of the increase came from Venezuela. In that country output rose 123,000 barrels daily average out of a total increase of 131,400 barrels in South America and the Caribbean. Colombia was second with an increase of 6,900 barrels over the 1946 average. Argentina was just getting started on its five-year plan and reported a small increase of 2,100 barrels daily average.

Drilling has been active in Venezuela since the beginning of the war, and 1947 output is double that obtained in 1939. One reason for the urgency of the current drilling is to prove up exploratory concessions. A very large acreage must be turned back to the government in 1948, and oil companies are wildcatting in an effort to determine what acreage to relinquish and what to retain for development. In 1946 there were 651 wells drilled in Venezuela, resulting in an increase of 21 percent in crude production. This year's increase was 11.5 percent. Outlook for 1948 is for an additional increase of nine percent to 1,290,000 barrels daily.

Operations in North America were carried on at a high rate in each of the three producing countries. Mexican developments are discussed in a special article elsewhere in this issue. In that country output rose 15 percent in 1947 under the management of Senator Bermudez. In Canada a very active wildcatting campaign has been begun in the western plains as a result of Imperial's discovery of the Leduc field which now is proven as a major reserve of more than 50 million barrels. Leduc wells are being held to low production for lack of an outlet, although they have potentials of about 2,500 barrels per day. When the Whitehorse refinery is moved to Edmonton and a pipeline laid to that city, production of the field will be allowed to increase. Standard of California appears to have found another field in the same general area, but the well is being drilled deeper before completion. Canadian production as a whole averaged 20,200 barrels daily in 1947, about the same as 1946. In 1948 it is estimated that Leduc will make up for the decline in older fields and permit an increase of some 2,000 barrels on a daily average basis.

In terms of percentage of world production, the United States continued its decline in 1947, Venezuela was unchanged and the Middle East increased. The following tabulation shows changes in leading nations and world subdivisions:

Percent of World Crude Production

	1946	1947	1948 (est.)
Principal Nations:			
United States	63.0	62.0	59.0
Venezuela	14.2	14.2	14.2
U.S.S.R.	5.8	6.2	6.4
Iran	5.3	5.1	5.3
Saudia Arabia	2.2	3.0	3.8
Western Hemisphere	**82.0**	**81.0**	**78.0**
North America	65.0	64.0	61.0
South America	17.0	17.0	17.0
Eastern Hemisphere	**18.0**	**19.0**	**22.0**
Middle East	9.7	10.3	12.2
Oceania & Far East	0.6	1.0	2.0
Europe	7.7	7.7	7.8

Changes in demand are considered likely to have an important bearing on the world supply and demand balance in 1948. The rate of increase in Latin American demand for petroleum is expected to be lower in 1948 than in 1947 because of a growing dollar shortage.

In France and in the United Kingdom the austerity programs have been affecting demand for some time and will continue to do so. Lack of steel is retarding the conversion from coal to oil in both countries. Imports of oil into the United Kingdom in the first nine months of 1947 actually were lower than in 1946 and about the same as in 1938. Coal production in the Ruhr is rising and is now not too far below the goal of 300,000 tons per month. British production is the highest since 1940 at 4.3 million tons weekly. Such increases will tend to lighten the load on fuel oil.

Marshall Plan countries in Europe are estimated to have consumed 300 million barrels of oil in 1947, an increase of about 30 percent over 1946. Marshall Plan estimates are that Europe could use 365 million barrels of oil in 1948, a still further increase of 20 percent. Delivery of such a large increase is considered doubtful by many, however.

In the United States the Economics Advisory Committee of the Interstate Compact Commission has estimated that United States net domestic oil demand in 1948 will increase about six percent to 5,795,000 barrels daily. The committee anticipates that this demand can be balanced by producing 5,385,000 barrels of crude daily, 385,000 barrels of natural gasoline and importing a net average of 75,000 barrels of crude from Latin American countries.

The Economics Advisory Committee estimated a modest 10 percent increase in demand for distillate fuels in 1948. There will be many who think that this estimate is too modest in view of the apparent demand for new burners and the increase in diesel installations. On the other hand, price may influence the matter before long. Several refiners increased No. 2 fuel oil price more than gasoline following the recent 50-cent crude advance initiated by Sun Oil Co. Most companies posted fuel advances 80 to 90 percent as great as gasoline advances. At some point the increased price of fuel will decelerate demand, but what that point will be there are few in the industry who want to guess.

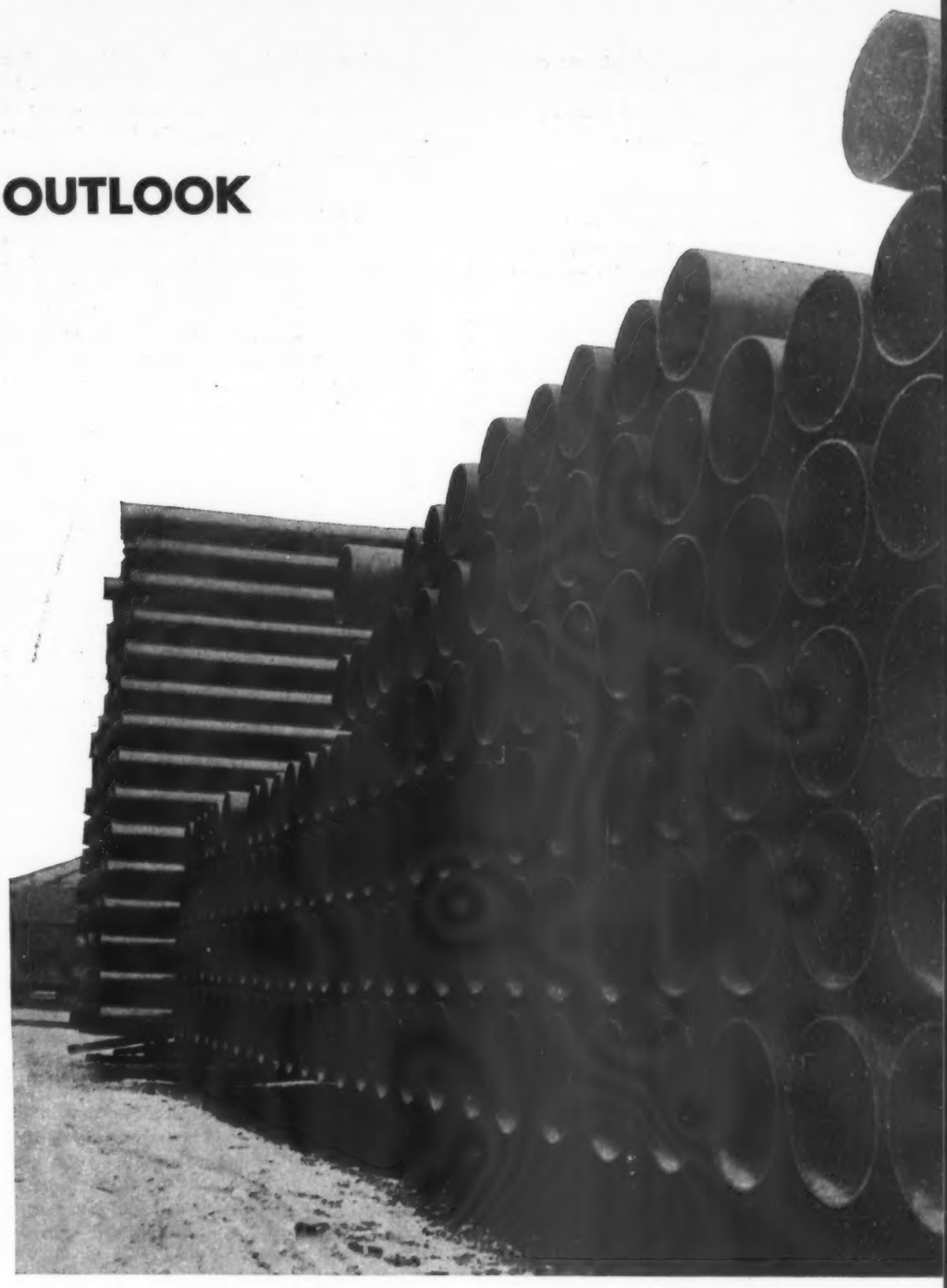
With the aid of largely-increased production from Oceania and the Middle East, it appears likely that the eastern hemisphere will be less dependent on the west in 1948 than heretofore. Barring major disasters, it should be somewhat easier for the oil industry to meet the demands made on it in 1948 than last year, but the margin of safety will be uncomfortably narrow for two years yet.

WORLD CRUDE OIL PRODUCTION

Thousands of Barrels Daily

	1939	1946	1947	1948 Est.
United States	3,465.7	4,749.1	5,078.0	5,385.0
Canada	19.1	20.6	20.2	22.0
Mexico	162.0	134.6	155.0	160.0
North America	3,646.8	4,904.3	5,253.2	5,567.0
Venezuela	567.0	1,064.0	1,187.0	1,290.0
Colombia	65.5	61.5	68.4	69.0
Argentina	51.0	56.9	59.0	60.0
Trinidad	52.8	55.0	54.0	52.0
Peru	37.1	34.2	35.0	34.0
Ecuador	6.3	6.5	6.3	6.0
Bolivia	0.6	1.2	1.0	1.0
Cuba	0.3	0.6	0.6	0.5
Brazil	—	0.2	0.2	0.5
South America & Caribbean	780.6	1,280.1	1,411.5	1,513.0
Western Hemisphere	4,427.4	6,184.4	6,664.7	7,080.0
Saudi Arabia	10.8	165.2	245.0	345.0
Iran	214.0	401.1	415.0	475.0
Iraq	84.5	96.7	96.0	96.0
Kuwait	—	16.2	43.0	140.0
Bahrein	20.8	21.9	26.0	28.0
Egypt	12.8	24.5	24.0	25.0
Middle East	342.9	725.6	849.0	1,109.0
Netherlands East Indies	17.0	5.7	14.0	100.0
British Borneo	20.0	5.7	30.0	40.0
India & Burma	28.0	8.0	8.0	9.0
Sakhalin	11.0	20.0	20.0	20.0
Japan	7.3	3.0	4.0	4.0
China	—	2.0	3.0	3.0
Far East	236.3	44.4	79.0	176.0
Romania	128.5	86.2	78.0	76.0
Austria	11.7	15.1	15.0	15.0
Germany	12.3	12.4	11.0	11.0
Hungary	3.0	14.1	12.3	12.0
Poland	10.7	2.6	2.5	3.0
Netherlands	—	1.2	4.0	6.0
Albania	2.5	1.0	1.5	1.5
France	1.4	1.1	1.0	1.1
United Kingdom	0.1	1.1	1.0	1.0
Czechoslovakia	0.2	0.5	0.6	0.7
Yugoslavia	—	0.1	1.0	1.0
Italy	0.2	0.1	0.2	0.2
Europe ex USSR	170.6	135.5	128.1	128.5
USSR	592.0	451.0	505.0	580.0
Eastern Hemisphere	1,311.8	1,356.5	1,561.1	1,993.5
WORLD TOTAL	5,739.2	7,540.9	8,225.8	9,073.5

IMPROVED STEEL OUTLOOK FOR 1948



ALMOST without exception every forecast prepared since the war giving probable demand for petroleum products or petroleum industry equipment has fallen short of actual requirements. The increase in the consumption of everything from highest test aviation gasoline to residual fuel oil has set new peacetime records for all these products. Looking ahead at the end of 1946, the Bureau of Mines of the United States calculated that the country's total needs for the ensuing year would increase 4.3 percent. In reality, when the figures are all in, the rise apparently will be rather more than twice that rate. Although crude production has been at an all-time high and refineries have been operating close to capacity, it has been necessary at times to allocate deliveries of gasoline in certain sections, and consumers of fuel oil have been warned repeatedly to use it as sparingly as possible, because an interruption of transportation under severe weather conditions might precipitate a serious shortage during the winter months. Sporadic scarcities during the past year have been attributed to inability to obtain steel for well drilling and for pipeline building in the full quantity desired. Irrespective of the causes responsible, the fact remains that the oil industry is hard pressed to supply the full volume of products that consumers are demanding.

Outside the United States conditions are more aggravated. Progress in repairing the damage inflicted by the war has been slow. Refining facilities are insufficient. Pipelines and tankers are inadequate. Oil is essential to the restoration of shattered economies, and nations in which the lack of dollar exchange is most acute have been offering premiums to obtain from American firms the products for which their need is most urgent.

Under the circumstances there is no reason to assume that the growth in demand for petroleum products will be less in 1948 than during the year just ended. The means of consumption certainly will be greater than ever before. Manufacture of automobiles, which has been held below the prewar level by various causes, has now hit its stride and is proceeding at the rate of five million vehicles per year. Installations of oil heating units are exceeding a million a year. The large number of diesel locomotives on order by the railways will be coming into service in increasing numbers during the coming twelve months. The plan for rebuilding industry in western Europe, if carried out, will call for great quantities of oil products. Careful surveys of the industry's outlook reveal no likelihood of a slackening of the rate of growth before 1951, if then. While the Bureau of Mines, in its preliminary estimate for 1948 forecast an increase in United States demand of only 5.9 percent, its calculations admittedly were based more on the probable extent of available supplies than on the volume of consumption if that were subject to no restraint.

For its part the oil industry is fully alive to the situation which it faces. It plans to drill more wells, lay more pipelines and to undertake a huge expansion of refining capacity just as rapidly as possible. Its estimates of the capital investment required by this unparalleled development have undergone as many upward revisions as have the estimates of demand. They have risen from one billion to two billion and now to five billion dollars for the next two years. The doubtful factor in the program is the possibility of obtaining the materials needed for these great undertakings within the time proposed. This brings us back once more to the problem of steel which is the crux of today's oil problem.

Since the rate at which the oil industry can install the new facilities which it deems necessary depends largely upon the quantity of steel obtainable and the promptness with which it can be delivered, it seems desirable to take a look at the state of affairs prevailing in steel. The first thing one learns is that the steel men themselves will give no binding assurances as to the amount of steel that will be available. They point out that in 1946 some 18,000,000 tons of production

was lost chiefly through shutdowns caused by strikes, but with a midwinter failure of their fuel supply (natural gas) and a scarcity of scrap metal as contributory causes.

In 1947 production amounted to 84,000,000 tons or over 90 percent of capacity, and during the final weeks of the year the average rate of operation was 97 percent of capacity compared with 69.8 percent a year earlier. Operation at this high rate is a remarkable feat in any industry. If it could be maintained throughout 1948, it would add another half million tons to the output, but nobody with practical experience in the steel business would predict or expect such a result.

In consequence of the rising trend in output throughout 1947 the production of pipe and tubing, the two forms of steel in which the oil industry is mainly interested, probably exceeded 6,000,000 tons, a full million tons greater than in 1946 and the largest ever attained in peacetime. Steel men feel that they have reason to congratulate themselves on the showing achieved in 1947 under the conditions prevailing, but the pressure that has been put upon them from every direction has brought an acute realization that the best they could do was not sufficient to meet the legitimate demands of all industrial ranks in this period of booming activity. They appreciate that the oil industry is experiencing an upswing in demand for its products and would however, is in a maelstorm of demand from every direction. What is true of oil is true in greater or less degree of every industry in which steel is a basic commodity. Automobile manufacturers, the building trades, the makers of all kinds of machinery, the manufacturers of containers, household and farm equipment and a long line of specialties all are clamoring for more steel than ever before, and each group naturally enough feels that its claims deserve special consideration.

While the output of pipe and tubing in 1947 was approximately 2,000,000 tons more than in the prewar year of 1940, shipments of sheet and strip steel to the automotive industry have increased 1,800,000. The construction trades received 3,300,000 tons more than in 1940 and the railroads took a million tons more. Agricultural equipment more than doubled its 1940 consumption. Machinery manufacturers received 8.2 percent of 1947 sheet and strip shipments as against 5.0 percent in 1940.

In certain quarters the claim has been raised that inadequacy of steel supplies to meet the needs of the domestic oil industry of the United States has has resulted from excessive exports, and criticism has been directed toward the State Department for encouragement of such shipments. Statistics for the first nine months of 1947 show that exports of semi-finished and finished steel during that period amounted to 4,901,700 tons, indicating a probable total for the year of around 6,500,000 tons. This represents about 7.7 percent of the production. In quantity the total is roughly the same as the 1941 export but less than the totals for 1940, 1942 and 1943. In 1940 the export market absorbed 7.5 percent of sheet and strip shipments; in 1947 the figure was 2.8 percent.

At a meeting of the Materials Shortages Committee of the Independent Petroleum Association of America, held in Tulsa on December 5, a communication was addressed to the heads of steel companies expressing the opinion that a larger percentage of steel output should be allocated to the manufacture of oil country tubular goods and pointing out in support of this proposal that, while the demand for petroleum is 77 percent greater than before the war, the amount of steel allotted to the production of casing and tubing is only two percent greater. The committee further recommended that the steel companies check their system of distribution in an effort to put an end to the so-called gray market in steel. It proposed that stocks of casing and tubing be established at strategic centers in the oil country to be employed under the supervision on committees of oil producers in the drilling of exploratory wells. It urged that shipments of tubular goods to other countries be held to a minimum and closed with a suggestion for cooperation between the oil and steel industries in the collection of scrap needed by the latter.

It is significant that the committee's statement was in no way denunciatory and did not attribute blame for the conditions it set forth on the steel industry or any other group but proposed instead a joint effort on the part of both steel and oil men to meet the problem. Significant, too, is the rejection by President Becker of the IPAA of the conventional Washington proposals for federal rationing. Said Mr. Becker:

"Independent operators regardless of their area of activity are particularly concerned with the recurring effort of a few in government to reimpose price controls and rationing, and also with the continuing shortage of steel and other products essential to maintain the expanded pace of development in industry reserves.

"Men of the industry well remember the handicapping results of wartime price controls and rationing on the petroleum industry. Now, in peacetime, any attempt to reimpose such restrictions on an industry that functions progressively not only would be un-American but would most certainly result in disadvantages to the public and to the oil industry. I can visualize no excuse for even seriously discussing further controls. We have met our obligations to the public and are entitled to continue to serve the public without governmental control."

Assuming that general industrial activity continues without abatement at the 1947 level or higher, it is improbable that total demands for steel from the oil industry or from other users of heavy tonnages can be completely filled during the coming year. Of one thing steel men are confident: granted normal operating conditions, production will show a substantial increase in 1948. Steel companies have under way large construction and expansion projects which will involve an investment of a billion dollars or more, equal to 20 percent of the present capitalization of the industry. These programs are still growing; on the basis of recent reports they are expected to make the following additions to capacity:

At least 3,000,000 tons per year in enlarged steel ingot capacity. At the start of 1947 total annual capacity was 91,241,000 tons per year.

Approximately 3,000,000 tons per year in improved and expanded pig iron capacity. At the beginning of 1947 total capacity was 65,709,000 tons per year.

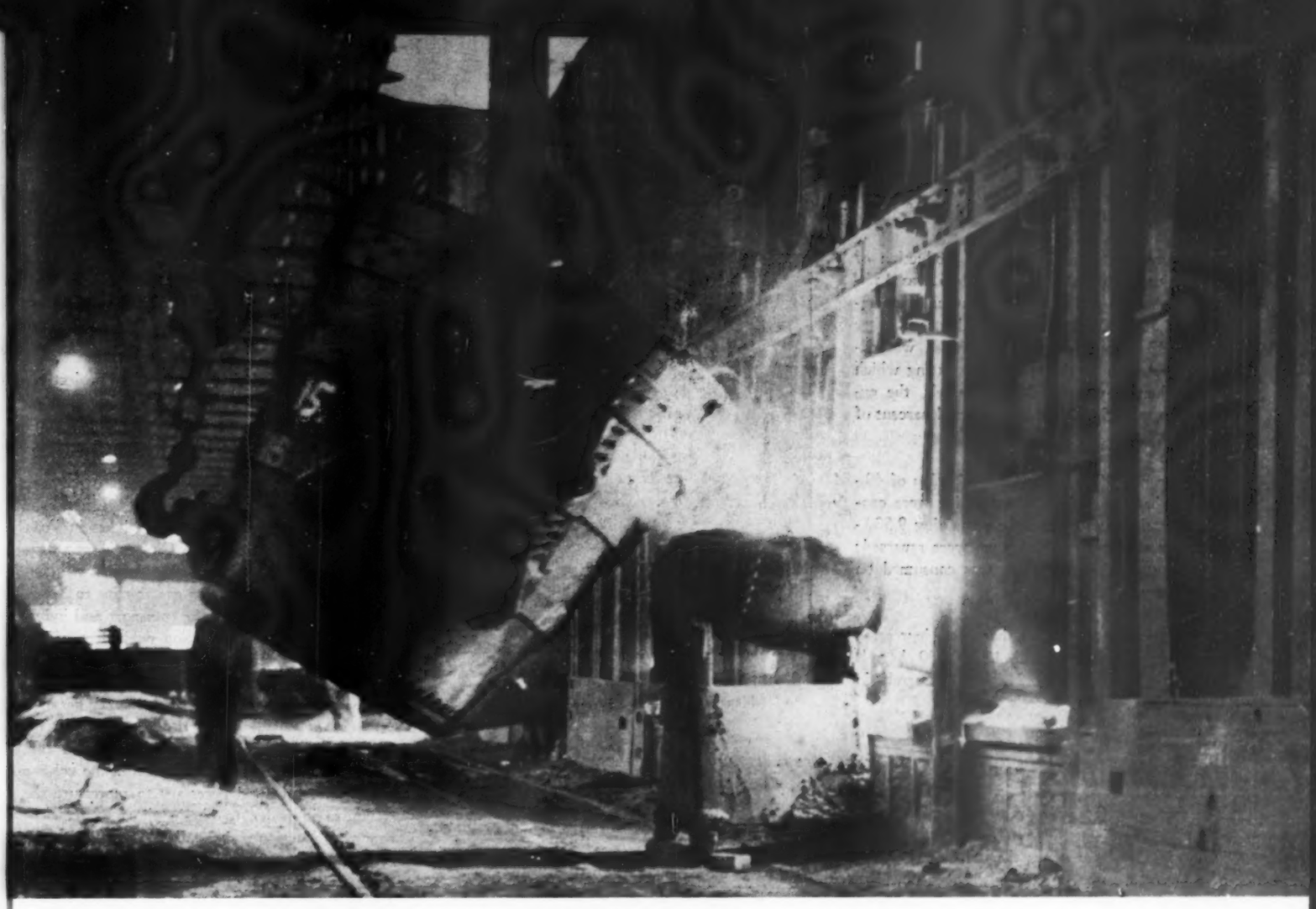
About 3,000,000 tons per year in improved and expanded coke capacity. At the start of 1947 total annual coke capacity of iron and steel companies was 60,280,000 tons.

More than 3,000,000 tons per year in improved and expanded sheet and strip capacity. Total capacity cannot be stated on the same basis as the above figures, but production in 1947 is estimated to have been at least 18,000,000 tons.

Substantial increases are scheduled for other finished steel products and improvements in addition to those listed.

Work on these new facilities is being pushed as rapidly as possible, and some of them will be in operation by midyear 1948. Inability to get prompt delivery of materials and equipment and other interruptions, such as those with which the oil industry is familiar, have delayed progress on construction in numerous instances. Among the large-scale projects under way for adding to steel plant capacity is the $500,000,000 program of United States Steel Corporation for modernization and expansion on which the company is spending an average of $20,000,000 monthly. This includes coke ovens, blast furnaces for pig iron production, steel furnaces for ingots, rolling mills, pipe mills, tin plate and wire plants with an aggregate capacity of nearly five million tons. Bethlehem Steel Company is investing $300,000,000 in enlarging its ingot capacity by 800,000 tons and adding 2,000,000 tons to its output of rolled products. Republic Steel Corporation has authorized the expenditure of $100,000,000 in new construction and improvements including a large pipe mill at Gadsdan, Alabama. Jones & Laughlin Corporation is devoting a like sum to re-equipment and general improvement. Other companies including National, Inland, Sharon, Granite City, Acme and Detroit are engaged in projects which will add another 2,000,000 tons to their annual capacity. A score of smaller companies are enlarging their facilities in volumes ranging from a few thousand to tens of thousands of tons.

In addition to the expansion of physical facilities, steel companies are seeking to add to their production by technological improvements. Experiments have indicated that higher production of pig iron can be obtained by increasing the



Open hearth furnace receiving charge of molten iron. Photos courtesy American Iron & Steel Institute.

amount of pressure exerted by blast furnace blowers and throttling exhaust gases. The use of oxygen to speed steelmaking in open hearth furnaces is being introduced by several companies and they expect to obtain production benefits. In general two main processes can be used. One uses oxygen to enrich the flame of the open hearth, and the other consists of injecting oxygen into the bath in the open hearth.

Melting time for open hearth steel can also be reduced by desiliconization of hot iron before charging it into the open hearth and by treatment of the hot metal for elimination of sulfur. New light narrow strip mills can roll strip steel at a much faster rate than before the war. Moreover, the installation of faster motors in many existing mills will increase the rolling capacity of such mills. A new pipe mill is being built which is expected to permit the rolling of pipe at a faster rate than heretofore. New methods of beneficiating iron ore have been devised. Improved coal-washing methods are being incorporated in new facilities now being installed. New control mechanisms and new construction designs in furnaces and rolling mills will also help improve steel production methods.

Faced by an overwhelming demand resulting from the greatly expanded requirements of scores of industries, steel companies during the past year have been forced to seek means of dividing their available supplies on a fair basis. The great majority have adopted a system of allocations, making deliveries to customers of a certain proportion of their past purchases. This is considered to be the most equitable method of treatment. One of the most important trade outlets is made up of the jobbers, dealers and distributors who furnish steel to thousands of small manufacturers, oil companies, builders, contractors, and others. These buyers have been required to accompany their orders with statements showing that purchases are being made for their invidual use. In some instances dealers may have been lured by the opportunity of a quick and illegitimate profit to divert some of their receipts to other channels, and this is held accountable in part for the gray market. In trade circles, however, it is insisted that the alleged importance of this market has been greatly exaggerated in published comment.

There are several factors in the outlook for the steel industry in 1948 that are regarded as favorable to the production of larger tonnages of the goods required by the oil industry and by other large consumers. Progress on the work of plant improvement and the completion of a certain amount of new construction will bring increased capacity, some of which will become available by midyear or early fall. Introduction of more efficient processes to replace methods and equipment that have become outdated, but that could not be replaced while wartime pressure was on, will help to lift the output of certain lines of products. Some market analysts believe that the abnormal demand for various kinds of goods such as household appliances which has prevailed since the close of the war will begin to level off in the near future, possibly before the end of 1948. Substitution of other forms of packaging to replace steel is expected to relieve pressure from the container industry.

Uncertain factors are the labor situation, possible interruptions to plant operation through fuel shortages, delays in the delivery of materials and continued stringency in scrap supply. The acute situation in scrap is indicated by the recently reported contract by Bethlehem Steel Corporation for the purchase from the Chinese government of a million tons of scrap collected as an aftermath of military operations in the Pacific theatre.

Opinion in the steel industry is virtually unanimous that in no respect would the situation be helped by the institution of federal control and rationing. This would not add a single ton to production. On the other hand, the red tape involved in government regulation would be cumbersome, and determination of the quantities of products to be made and their distribution, if left in the hands of bureau employees unfamiliar with plant operations and industry requirements, would inevitably lead to confusion and inefficient operation resulting in lessened rather than increased output.

MEXICO'S PROGRAM OF OIL EXPANSION

By Senator Antonio P. Bermúdez

THE average annual crude oil production of Mexico during the years 1920-25 was 156,250,000 barrels and the average annual exportation 143,300,000 barrels of all products; in other words, 92 percent of the oil obtained was exported. As late as the year 1937, during which the production was 46,900,000 barrels, the exportation was 25,000,000 barrels or 64 percent of the total.

In the year of 1946 we had a production of 49,200,000 barrels, 39,700,000 of which were consumed in the country and the remaining 9,500,000 were exported. The figures were reversed; 80 percent of the production was consumed on the country.

Our domestic consumption has been increasing from a yearly average of 12,850,000 barrels (period of 1920-25) to 21,900,000 barrels in 1937 and 39,700,000 barrels in 1946.

Our forecast is that during the current year we will produce 55,800,000 barrels, consume 44,300,000 barrels and export 11,500,000 barrels. The foregoing figures may give an idea of the role played by Pemex in the joint effort to foster industrial development, as the industrial growth of a nation may be judged by the domestic consumption of fuel.

Petroleos Mexicanos is carrying out a vast drilling and construction program that will permit it not only to insure that the increasing domestic demand will be adequately supplied but also to participate on a greater scale in the international market supply, since we have creditable evidence that our yet undiscovered oil reserves will enable us to collaborate, even in a modest way, in the reconstruction of the world and to stand together with our northern neighbor, not only in time of peace but also in the unfortunate event of new emergencies.

With this purpose in view, Petroleos Mexicanos has initiated the development of an intensive wildcat-drilling program, after having located some 64 or more structures that may contain accumulations of oil; in these, not less than 125 wildcat wells will be drilled, apart from the exploitation wells necessary for the development of the structures that will be found productive.

The proven reserves as of present day—estimated at about one thousand million barrels—guarantee the supply of our domestic needs for a technically satisfactory period, leaving a convenient surplus volume for export. Yet our intentions are to increase our reserve as much as possible so as to give a more consistent support to internal consumption and help the export market in a more liberal manner than heretofore.

The refineries and shipping terminals, established in Mexico in the past, were built primarily with a definite view to the export business and as a secondary purpose to supply the domestic demands of the country. We have maintained them as we received them; in certain respects we have improved them because we do not wish to neglect the export market. Therefore, as far as the throughput capacity of the installations is concerned, we are prepared to intensify exports.

Senator Antonio P. Bermúdez.
Managing Director, Petroleos Mexicanos

Our program for the domestic supply rests upon an economic basis. In order that the products may reach the consumer regularly and at a low cost, it started with the extension, already completed, of the Atzcapotzalco refinery at Mexico City and of the pipeline system supplying it with raw material.

The new refinery has a daily capacity of more than 45,000 barrels and obtains the totality of its input products from Poza Rica; it supplies 27 marketing agencies besides the Federal District. It can also supply 1,000 barrels per day of high-octane aviation gasoline.

This new refinery and the first stage of the Poza Rica installations were studied with great detail in their economic aspect. It required a total investment of $147,000,000 Mexican, of which $48,500,000 represents the cost of the materials purchased in the United States and $98,500,000 the cost of labor, materials and expenses in Mexico. The gross income to be obtained from the sale of refinery products amounts to $1,020,953 Mexican per day, and the operating cost and sales expenses amount to $730,649 per day, leaving, therefore, $290,304 daily for amortization and profits.

Our next project includes a refinery of 30,000 barrels' capacity in Salamanca, Guanajuato, and the pipeline to supply it. The study of the installations and the purchasing program of material for the refinery are now developed.

The pipeline is being constructed mainly with pipe manufactured in Mexico, the rest with American pipe, bought in advance and being received at present.

We have estimated that the complete project requires an investment of $95,486,000 Mexican, of which $39,897,000 covers imported materials and $55,590,000 applies to labor, materials and expenses in Mexico.

The first stage of the work carried out in Poza Rica as part of the Mexico City refinery extension project includes installations which will contribute to the servicing of a gas pipeline to Mexico City that will permit the transport and industrial utilization of 50 million cubic feet of gas daily. These installations will be complemented with others that will allow a total extraction of the natural gasoline from the natural gas, the removal of sulfur from the gas destined for fuel, the utilization of the eliminated sulfur and, finally, the return to the formation of the volume of dry gas estimated necessary to repressure the structure in order to obtain the most efficient rate of production and the ultimate maximum recovery. It is estimated that the required investment will be $61,580,000 Mexican, of which $20,860,000 covers imported materials and $40,720,000 provides for labor, materials and local expenses.

The development program contemplated for the near future includes various tentative projects which are briefly tabulated as follows:

(1) Lubricants and paraffin plant, Mexico City refinery; total investment $47,650,000; daily net income $103,500.
(2) Pipeline across the Isthmus and refinery on the Pacific Coast; total investment $33,150,000; daily net income $25,730.
(3) Cracking plant at Tampico; total investment $25,000,000; daily net income $26,500.
(4) Refinery at Guadalajara; total investment $24,050,000; daily net income $16,400.
(5) Refineries at Monterrey and Torreon; total investment $100,000,000; daily net income $70,443.

Among the very few elements still antagonizing the Mexican petroleum industry, the idea is promulgated that it constitutes an ever-growing burden upon the tax payers; in other words, that its operating costs are a burden upon the Federal Treasury; but this is false and can be easily contradicted. The truth is that Petroleos Mexicanos is an organization that discharges its obligations out of its own income, and, furthermore, it shares in the public expenditures exactly and punctually in compliance with the existing fiscal regulations. As a matter of fact, its payments to the Federal Treasury have been as follows, in Mexican currency:

Taxes and Payments to the Federal Treasury

1938 March. 19-Dec. 31	$ 41,126,013.02
1939	64,336,816.12
1940	96,612,436.25
1941	100,443,970.08
1942	86,147,827.99
1943	122,684,633.73
1944	93,553,527.71
1945	124,188,390.24
1946	134,226,803.72
1947 (Up to Sept. 30)	165,800,000.00

The total income of the industry for the years above mentioned has been as follows:

Total Income of Petroleos Mexicanos

1938 (Mar. 19-Dec. 31)	$154,908,077.42
1939	242,263,866.14
1940	278,652,216.49
1941	311,490,353.80
1942	307,313,615.95
1943	344,459,733.95
1944	392,858,647.00
1945	460,471,041.56
1946	568,003,720.18
1947 (To Sept. 30)	569,700,000.00

As is usual in all enterprises of the same nature as Petroleos Mexicanos which are engaged in an extractive industry, the total income is used to cover the full expenses of operation and maintenance, to pay for capital investments intended for the development of its activities, to pay taxes and other miscellaneous obligations. In the case of Petroleos Mexicanos it includes, besides, the payment for the indebtedness arising out of the expropriation of the old petroleum companies.

To cover the cost of the new Mexico City refinery and its supplementary installations, a loan was negotiated with the Export-Import Bank of the United States for the amount of $48,500,000 Mexican, to be redeemed in five years as from 1946. Up to date all installments on principal and interest of this debt have been met in due time and even paid in advance.

In the same manner and for the realization of other projects which are self redeemable, obligations have been incurred with the "Nacional Financiera" (a public credit institution,) for the amount of $80,000,000 Mexican to be totally redeemed in 1952.

In conclusion the following quotations are taken from the report made by the auditors (an independent public accounting firm,) who analyzed our general balance of December 31, 1946:

(1) Petroleos Mexicanos has available sufficient cash, securities and liquid assets to meet its immediate obligations.

(2) The total of its liabilities at short and long terms, plus contingent liabilities, and invested in negotiable credits of assured recovery and in fixed properties carried at a conservative valuation, thus leaving an ample surplus as investment of its endowment and the corresponding reserves.

(3) the current assets keep a ratio of 2.82 to one with short term debentures; the working capital has a ratio of 1.10 to one with short and long term liabilities; and the total fixed assets in relation to long-term liabilities, contingencies and special reserves keep a favorable proportion of 1.7 to one; therefore, all the above-mentioned margins, as well as the other items of the assets not in connection with liabilities, imply judicious investment of capital.

(4) The fixed assets are burdened with excessive depreciation and amortization reserves. The policy followed to depreciate these properties shows severe judgment of the management. Therefore, if a revaluation were to be made of the fixed assets, a surplus would be obtained that would increase the capital.

(5) From the accounts commented upon, it is to be inferred that a condition of solvency exists, as well as an acceptable paying capacity.

(6) Based on the aforesaid, we are in a position to state that, in our opinion, the balance referred to adequately reveals the financial conditions of Petroleos Mexicanos as of December 31, 1946.

It is certain that the industrial future of the world depends on the development of its natural resources.

Mineral fuels such as oil, coal and lignite and the metal and non-metal ores of iron, lead, copper and zinc represent a large portion of the wealth and power of nations. Without them their economy would be seriously handicapped.

The increase in production of all mineral resources is compulsory for the welfare of humanity. Mexico wants to do its share in this task of primary importance which is incumbent upon all nations of this western hemisphere.

The carrying out of this policy means strengthening the ties of mutual friendship and good neighborliness; this is a matter of greatest interest to us all.

Mexico asks only that the materials so necessary for the development of her industry, without which we cannot expand, be sold to us at this time when they are needed badly.

Helping us to invigorate our economic structure is good business, a good investment for America which certainly would rather have a prosperous neighbor and a first-class customer. That will be the case if we are able to overcome our present difficulties and successfully carry out our plans.

Crude stabilization plant, Poza Rica field.

HEARINGS LAY GROUNDWORK FOR FUTURE U. S. SYNTHETIC RUBBER POLICY

AGREEMENT among federal officials, members of congress and representatives of the rubber petroleum industries is complete on the point that, for reasons of national security, a synthetic rubber industry should be maintained within the United States. This, at least, is the consensus of witnesses appearing befor the House Armed Services Sub-Committee No. 3, headed by Rep. Paul W. Shaffer (Rep., Mich)., which has been holding a series of hearings preparatory to enactment of permanent rubber legislation.

Not so complete, however, is agreement as to methods of operation and the extent to which the nation's synthetic rubber industry shall be maintained. Some members of the rubber industry apparently desire to delay action, this being the sentiment of some major company spokesmen. Other rubber industry members, oil company representatives and federal officials believe that action must be taken by the new Congress if the synthetic industry is to be preserved.

There also seems to be complete agreement between industry and government men that the synthetic industry will develop most rapidly under private ownership and operation. Whether this ownership and operation shall be entirely in the hands of the big rubber manufacturing companies, or whether small independents, may depend upon the amount of synthetic rubber production that will be required by law.

Legislation proposed by the Army and Navy Munitions Board would require maintenance of standby facilities with total active and standby capacity of at least 600,000 long tons a year of general purpose synthetic rubber. This is the amount also recommended by the National Security Resources Board.

The petroleum industry position, as stated in hearings before subcommittee, is that plant capacity for 450,000 tons of butadiene should be kept in standby condition with one alcohol plant being maintained to make up the 600,000-ton total.

Oil industry spokesmen told the subcommittee that legislation should assure a minimum consumption of synthetic rubber adequate to maintain operation of as many basic governmental units as possible without unduly handicapping rubber product manufacturers or the public. This is because several synthetic plants still are operating, rubber is being consumed at a high rate and natural rubber supplies are not yet sufficient for all purposes.

The requirement to use synthetic in all kinds of tires will greatly stimulate research to improve quality of present rubbers and to find new and better ones, the oil men said. Better quality butadiene-styrene type rubber already has been developed, promising wearing qualities equal to 135% or more of those natural rubber made with EPS carbon black, and such rubbers can be made in present plants with little basic change. If sizable production of synthetic rubber is assured in the future, more of this type of improvement will, without question, reach rapid fruition. This is in line with the history of all successful synthetics. It is axiomatic that any synthetic, once put on the market, has never disappeared but has always become better as time goes on and has always become cheaper.

The required use of a minimum of about 250,000 tons of synthetic in all kinds of tires is feasible, oil men hold. The accompanying table compares past rubber consumption with estimates of the future and indicates the possibilities of the use of synthetic rubber at the rates prescribed in the R-1 control order of CPA of May 2, 1947:

"These figures reveal that we could expect to use at least 250,000 tons of synthetic rubber in tires without regard to tubes and tire repairs," an oil industry witness told the subcommittee. "We know from earlier war experience and the higher R-1 requirements then in force, that even larger percentages and larger quantities of synthetic than these could be used. The production of better rubbers and constantly improving techniques would further assure safe higher limits. Furthermore, the advertised trend toward larger passenger car tires will inevitably swell the total tonnage of rubber to be used."

If legislation would assure production of at least 250,000 tons of butadiene-styrene type rubber at the outset, all of the seven basic petroleum butadiene and a corresponding capacity of copolymer plants could be operated by private interests, within reasonable economic limits. Furthermore, the rubber could be made right now at prices no higher than the present GRS price of 18½ cents, all reasonable capital charges and profits included.

With assurance that at least this much synthentic rubber must be used, with stipulation of kind, it is believed that all the present seven butadiene plants, with a corresponding capacity of copolymer plants, could be transferred to private operations; thus a satisfactory competitive supply could be maintained, with some plants in the hands of interests other than those of the larger rubber product manufacturers; the greatest economic good could be obtained from the war rubber plant investments already assumed but unpaid for by the American public; and the best measure of national security assured.

However, if only 100,000 tons of synthetic is required by law, as advocated by some rubber industry men, not more than two or three of the large butadiene and copolymer plants can be economically operated and, if passing to private hands, there would be too few to distribute among the four largest rubber product manufacturers alone. The many smaller manufacturers could have no control whatsoever as to quantity and quality of rubber supply available to them.

Mandatory use of such a small amount of synthetic rubber would, thus, unquestionably result in continued operation for a long indefinite period of only one or two plants by governmental agencies which could have little or no benefit of future private research. Also, if the synthetic is not required for tire use in all sizes in equal minimum percentages for everyone, larger manufacturers can use their quotas in mechanical goods and the smaller manufacturers producing tires predominantly would be at a decidedly unfair competitive disadvantage because larger concerns could advertise tires of 100% natural rubber, which the public has been led to think it wants, and the smaller companies could not do so.

The desirability of requiring the use of synthetic in all sizes and kinds of tires, at least to the degree imposed in present R-1 orders, is stressed, in the oil industry viewpoint. Up to now the industry has failed to produce for the market a rubber which can be used satisfactorily to any large degree for large truck and bus tires. The requirement that synthetic be used in the big

U. S. Rubber Consumption

Year	Tot. Tons of Rubber Used—All Purposes	Tire Production	Rubber for Tires	Tire Syn. by R-1 Ord.	Tube and Tire Repair Rubber	Syn. Use Based on R-1 Order
	Tons	Units	Tons	Tons	Tons	Tons
1939	564,000	49,933,000	359,000	160,000	69,000	229,000
1940	684,000	50,965,000	409,000	181,000	73,000	254,000
1946	1,039,000	66,466,000	617,000	259,000	97,000	356,000
1947	1,110,000	74,000,000	689,000	291,000	99,000	390,000
1948	1,057,000	69,500,000	644,000	273,000	98,000	371,000
1949	1,020,000	65,000,000	613,000	260,000	88,000	348,000
1950	995,000	64,000,000	591,000	252,000	87,000	339,000
1951	1,007,000	64,500,000	602,000	255,000	87,000	342,000
1952	1,025,000	66,000,000	617,000	261,000	88,000	349,000

tires is seen as an important stimulant to progressive improvement and manufacturing techniques. Although there may be, at times, some additional public cost entailed in the mandatory use of synthetics, it is held this would not be large percentage-wise and at any rate it would be a small cost to pay for greater future national security.

Little or no value will be derived from the present government plants if little or no synthetic rubber in big tires is required. The rubber industry will not be interested in acquiring any of these units for any purpose, under the restrictions of the National Security Clause, and progress in the use of present and even new types of synthetic in the field of large, heavy-duty tires and in the adaptation of present plant processing will be scant because effective stimulus will be removed.

The case against shutting down the plants or merely maintaining them in standby condition is summed up by an oil industry witness, as follows:

"The 600,000 tons of capacity recommended to be kept in standby condition, even with the best of care to be devised and event at tremendous initial and annual maintenance expense, cannot be restarted and discontinued at whimsical intervals as a means of indirectly regulating the price of imported natural rubber. At best this standby capacity will be a very poor secondary line of defense in time of emergency because it can now produce no rubbers satisfactory for heavy-duty vehicles, the one field in which we have failed to solve the problem of a satisfactory natural rubber substitute.

"With the promise of developments indicated by progress to date, and in view of the advances in processing to which research already points; in sight of the production of improved carbon blacks and other rubber additives and chemicals particularly effective in synthetic rubbers; noting the great economic value from continued operation to be derived from public investments in present synthetic rubber facilities; considering the advance toward complete independence of natural rubber sure to ensue more speedily from continued large scale use of synthetic rubber, and, thus, a far greater guarantee of national security against emergencies, it would seem nothing short of a national folly and disgrace to merely shut down all these plants, yet further charge to the public account the large sums required for initiating and maintaining them in standby condition—sums of money which might well be saved and to which other savings in the form of income from plants sold and leased for continued production may well be added."

If important rubber legislation is not passed until an abundance of natural rubber is reaching this country, all the momentum of the war program will be lost. Manufacturers of butadiene and rubber will have drastically to curtail production, which will markedly increase cost. Some basic plants will have to be shut down, greatly impairing their potential sales value and use, because raw materials will be diverted to other markets, organizations will be dispersed and plants will begin to deteriorate.

Already it has become necessary to reduce butadiene production in the basic plants by 30 percent. Increasing imports of crude and the approach of adequate stocks of tires and other rubber goods to near saturation at the year-end presage further curtailment of synthetics.

It is the oil industry view that the minimum amount of synthetic rubber that shall be made and used annually in the United States should be equal to one-third of all the new rubber consumed each year, for a period of five years, and that this much should be required in tires alone. At normal pre-war rubber consumption rates this would be about 250,000 long tons. Experience during this period will determine the course beyond. This amount was arrived at after considering the minimum number of basic butadiene plants which industry should be encouraged to take over with the promise of operating at economical percentages of capacity. There are two small plants and six large plants, five of the latter being approximately 50,000-ton units while the sixth (the Neches plant) consists of two such units. These seven units of approximately 50,000 tons each were built under the stress of war times and none of them can be economically operated at low percentages of capacity, although either 50,000-ton unit of the Neches plant could be so operated. A required minimum annual consumption of 250,000 long tons of synthetic rubber would require a little less than 200,000 tons of butadiene. Four of the 50,000-ton units at rated capacity would suffice but six of them could be economically operated at about 70% of rated capacity which would yield a little more than 200,000 tons of butadiene, therefore it is reasonable to expect that various units of industry would take over at least this number. Any less than 250,000 tons of rubber consumption required by law might easily result in acquisition of plants by the four larger rubber concerns only, leaving the smaller ones dependent upon them for a supply.

If industry can be encouraged to take over at least six units, some of the smaller concerns may be expected to obtain interests in at least two of them, and all of the six may be expected to compete eagerly for business because only at high capacity can economical production rates be maintained. Such competition also would work for lowest possible market prices. This is the industry view.

Viewpoint of the National Security Resources Board, which includes six cabinet members, is given by its chairman, Arthur M. Hill. He told the subcommittee that "there should be maintained in the interest of the national security, in addition to stockpiles of natural rubber which are to be acquired and rotated, pursuant to the Strategic and Material Stockpiling Act . . . a domestic rubber producing industry, technologically advanced, capable of rapid expansion and with sufficient productive capacity to assure availability in times of national emergency of adequate supplies of rubber to meet the military and essential civilian needs of the country."

The board recommends that permanent legislation to carry out this national rubber policy be enacted prior to the termination of Public Law 24 on March 31, 1948. It recommends that the legislation provide:

1. For the first two years, at least one-third of the total new natural and general-purpose synthetic rubber used in this country should be domestically produced general-purpose synthetic rubber. After that period, the proportion (not to exceed one-third) should be determined by the President.

2. The total operating and standby capacity for the manufacture of general-purpose synthetic rubber should be not less than 600,000 long tons a year.

3. For the first two years, at least four percent of the total new rubber consumed annually in the United States should be domestically produced synthetic rubber suitable for automotive inner tubes. After that period, the percentage (not to exceed four percent) should be determined by the President.

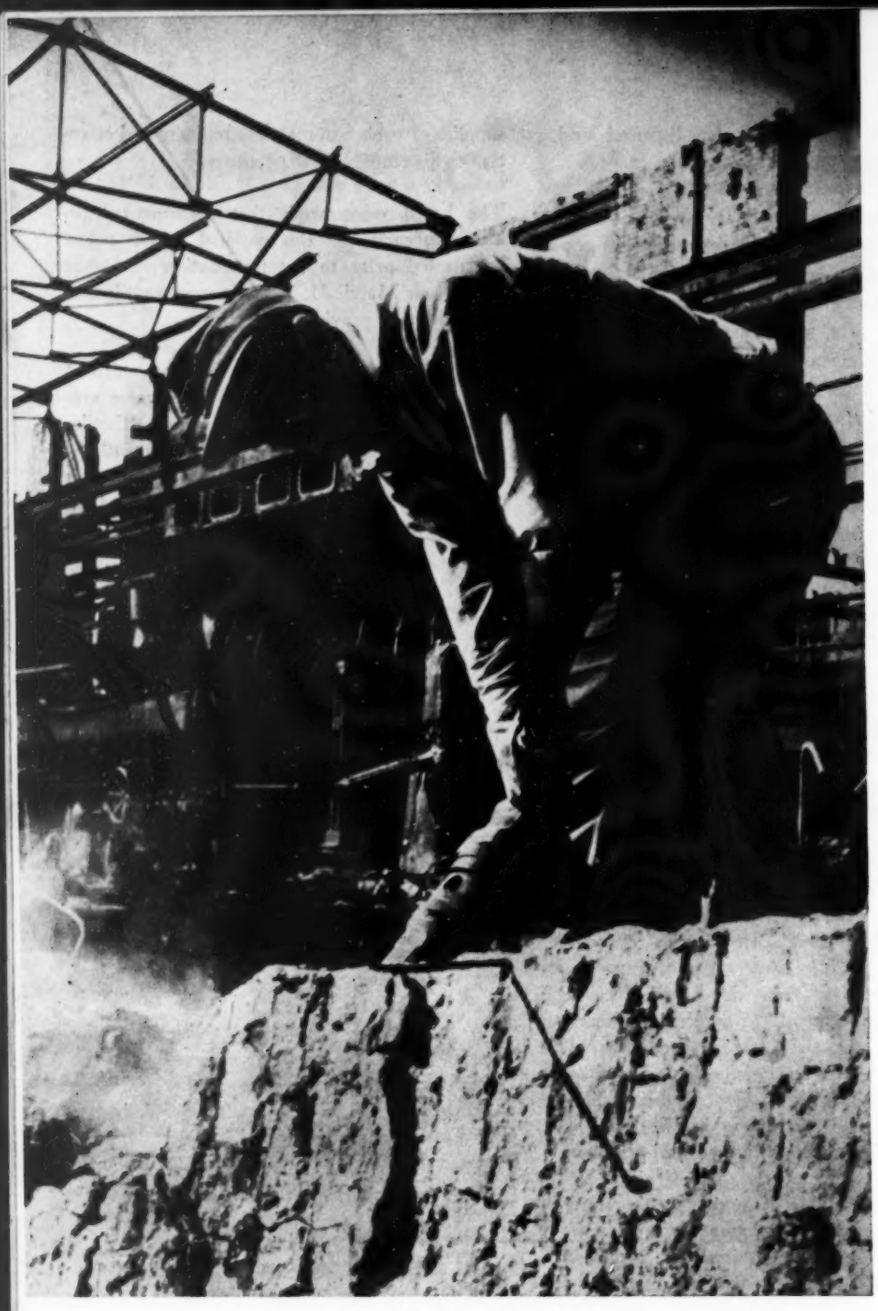
4. Mandatory usage should be limited to automotive type tire casings and inner tubes, and latex foam cushions.

5. A framework should be established for the transfer (with appropriate safeguards) of the Government-owned synthetic rubber facilities either by sale or by lease to private industry. Facilities not thus transferred but necessary for a capacity of 600,000 long tons annually should be maintained in standby condition by the government.

6. The existing patent structure in the synthetic rubber field, to which the government is a party, should be so modified as to establish a sound basis for disposal of the government-owned synthetic rubber producing facilities as well as to provide incentive for competitive research and development.

The board said further that research and development in the methods of formulating and producing synthetic rubbers and necessary intermediates from agricultural and non-agricultural sources should be vigorously pursued by the government and encouraged in industry. Continued support should be given by the government to the development of natural rubber production in this country and in other parts of the western hemisphere.

These recommendations are largely in line with legislative proposals of the Army and Navy Munitions Board, which also would set up a governmental agency to administer the national rubber policy. This organization would consist of a rubber council made up of the secretaries of War, Navy, State and Commerce, with the Secretary of Commerce as chairman; and a rubber administration in the Department of Commerce.



Shell refinery in Hamburg-Harburg during reconstruction

GERMAN OIL INDUSTRY MAKES SLOW RECOVERY

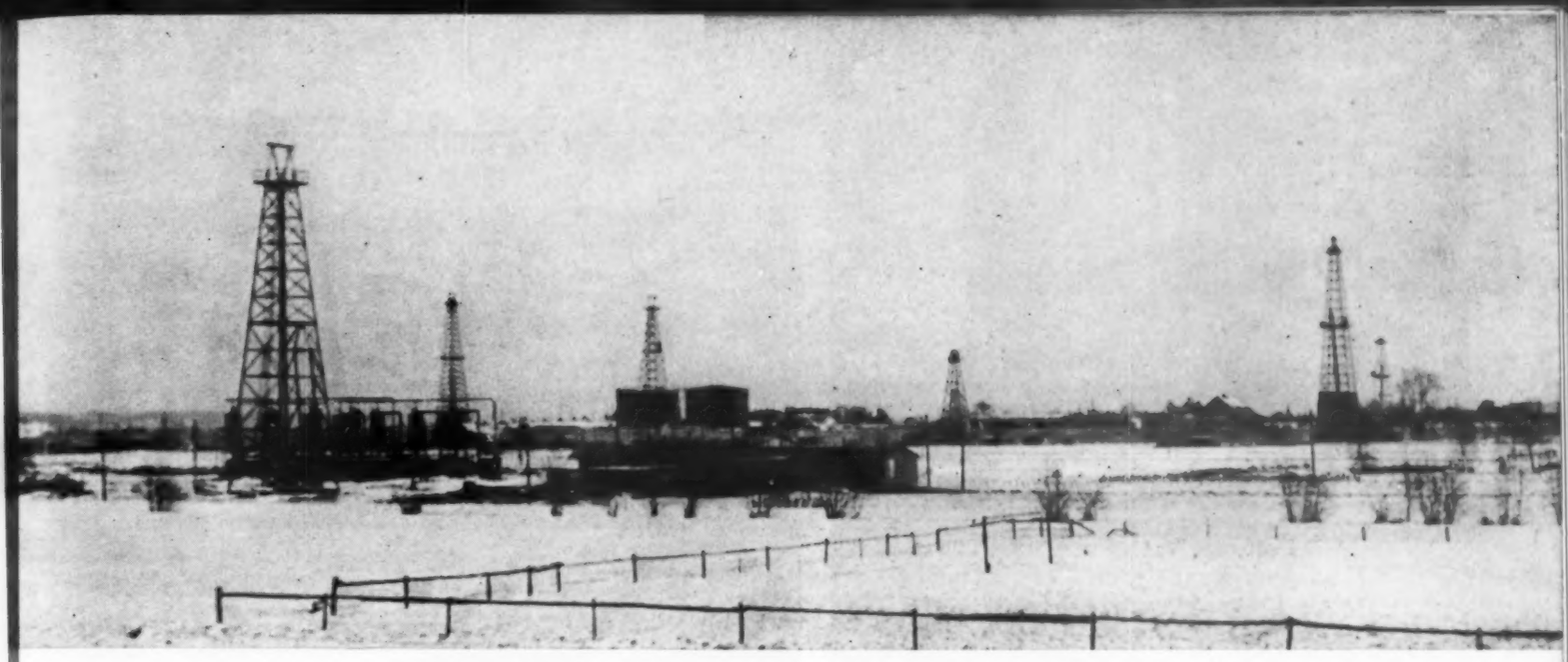
By Alfred M. Stahmer

AT the close of the war in 1945 the oil industry in Germany was in a state of complete demoralization. Production had fallen to a low point, refineries were closed down or destroyed; scarcely any supplies were available to consumers for months after the capitulation. Gradually a start was made toward partial restoration. Drilling was resumed with such equipment as was available, and refineries that had survived the bombing attacks began operation on a limited scale.

For various reasons, however, progress has been extremely slow. Chief of these reasons are lack of labor and shortages of material. The continuing bad food situation has affected morale and is responsible for abstentions from work and frequent absences of employees. Many of the younger men who served in the army are still held in prison camps in Russia and elsewhere, and some of the technicians are away because they are subject to denazification proceedings. Lack of necessary equipment including spare parts for repairs has held up operations in many places. Development of the field adjoining the Dutch border discovered during the war was held up for months by lack of tires for trucks, field tank cars, electric power installations and steel for canal loading facilities. Owing to similar difficulties, the youngest German field, Adorf, discovered in 1946, has not been able to get into production. In 1944 a well at Reitbrook reached a prospective gas zone at a depth of about 9,000 feet but has not yet been finally tested, partly because no blowout preventer or well head fittings were available. Lack of coal often causes an interruption of electric current stopping the electric pumps in the fields.

In spite of all deficiencies, some progress has been made by the German oil companies and the foreign companies operating here under the control and with the cooperation of the occupying powers. As is well known, 95 percent of the country's producing and refining resources are located in the British zone where the North German Oil Control supervises oil operations. In the American zone there are three small fields, two of them situated in Baden near the Rhine, (Forst and Weingarten,) and the other one in Bavaria (Tegernsee). The Russian and French zones have no oil production. In the Russian zone there are several synthesis plants which are in partial operation. The French zone has the refinery of Ludwigshafen-Oppau which treats the Badish oil.

As far back as 1870 oil was produced in Germany from small pits at Wietze and Nienhagen. During the first decade of this century explorations at Wietze, Nienhagen and Eddesse caused something like an oil boom in the Hanover province leading to wild speculation in shares and soil. The production of the upper oil horizons exploited at that time soon declined, but in the late twenties at Nienhagen, the largest field in northern Germany, the really productive oil pays were explored and more companies entered the industry. Foreign concerns, notably the Socony-Vacuum Oil Company, obtained concessions, and as a result of wildcatting it soon became clear that wide districts of the provinces of Hanover, Brunswick, Oldenburg and Schleswig-Holstein could be regarded as oil prospects. By 1938 fourteen fields in northwestern Germany were exploited, namely Nienhagen, Reitbrook, Wietze, Heide, Oberg, Molme, Eddesse, Steimbke, Gifhorn, Eicklingen, Meckelfeld, Broistedt, Sottorf and Adolfsgluck. The number has since increased to twenty-five oil fields and one natural gas field. This considerable result was due partly to the exploration program promoted by the state after 1934 and to the geophysical and geological research work of the Reichsamt fur Bodenforschung (Geological Survey). In 1940 the annual output reached 1,046,151 tons, an all-time record which was, however, gained mainly by the overproduction of the Reitbrook field. The trend of the past several years can be seen from Table II. There are three main oil provinces in northwestern Germany: Schleswig-Holstein-Hamburg, Hanover



General view of Reitbrook field

Table I
Annual Oil Production of Northwestern Germany
(in metric tons)

	1938	1940	1942	1944	1945	1946	1947 8 Months
Schleswig-Holstein-Hamburg:							
Heide	25,470	231,347	141,301	125,817	90,596	74,364	37,423
Reitbrook	65,556	357,222	103,885	35,919	34,471	34,274	22,730
Meckelfeld	1,810	6,086	7,028	4,531	2,326	2,665	1,332
Sottorf	422	1,600	324	99	—	—	—
	93,258	596,255	252,538	166,366	127,366	111,303	61,485
Hanover:							
Etzel	—	—	1,066	3,137	1,821	4,719	2,611
Seimbke	3,841	40,177	47,780	53,533	23,572	46,182	28,144
Hademstorf	—	—	1,379	10,134	4,108	6,704	3,987
Thoren	—	—	12,464	22,398	16,039	19,212	11,230
Wietze	43,448	38,276	36,639	32,720	19,931	22,356	13,732
Fuhrberg	—	12,769	45,977	60,695	33,866	51,084	28,278
Nienhagen	358,190	281,916	263,335	231,473	166,911	167,510	93,031
Eicklingen	2,380	37,712	29,934	19,541	13,530	14,309	8,908
Wesendorf	—	—	—	34,273	51,418	45,706	28,535
Eddesse	8,783	5,214	6,049	4,064	2,960	3,014	1,773
Oberg	16,903	17,048	16,114	12,326	8,265	9,497	3,830
Broistedt	947	708	4,577	2,570	1,614	2,547	1,730
Hohenassel	—	—	—	15,009	31,534	48,642	13,418
Molme	9,510	8,794	10,683	14,383	7,766	7,158	3,112
Others	2,986	7,276	4,072	3,421	1,898	3,258	1,795
	446,988	449,890	480,069	518,677	385,233	451,898	244,114
Emsland:							
Lingen	—	—	—	19,668	16,255	40,709	25,049
Emlichheim	—	—	—	3,959	5,141	24,122	30,213
Georgsdorf	—	—	—	3,056	9,269	14,897	12,585
	—	—	—	26,683	30,665	79,728	67,847
Total Production of Northwestern Germany	540,246	1,046,145	732,607	711,726	543,264	642,929	373,446

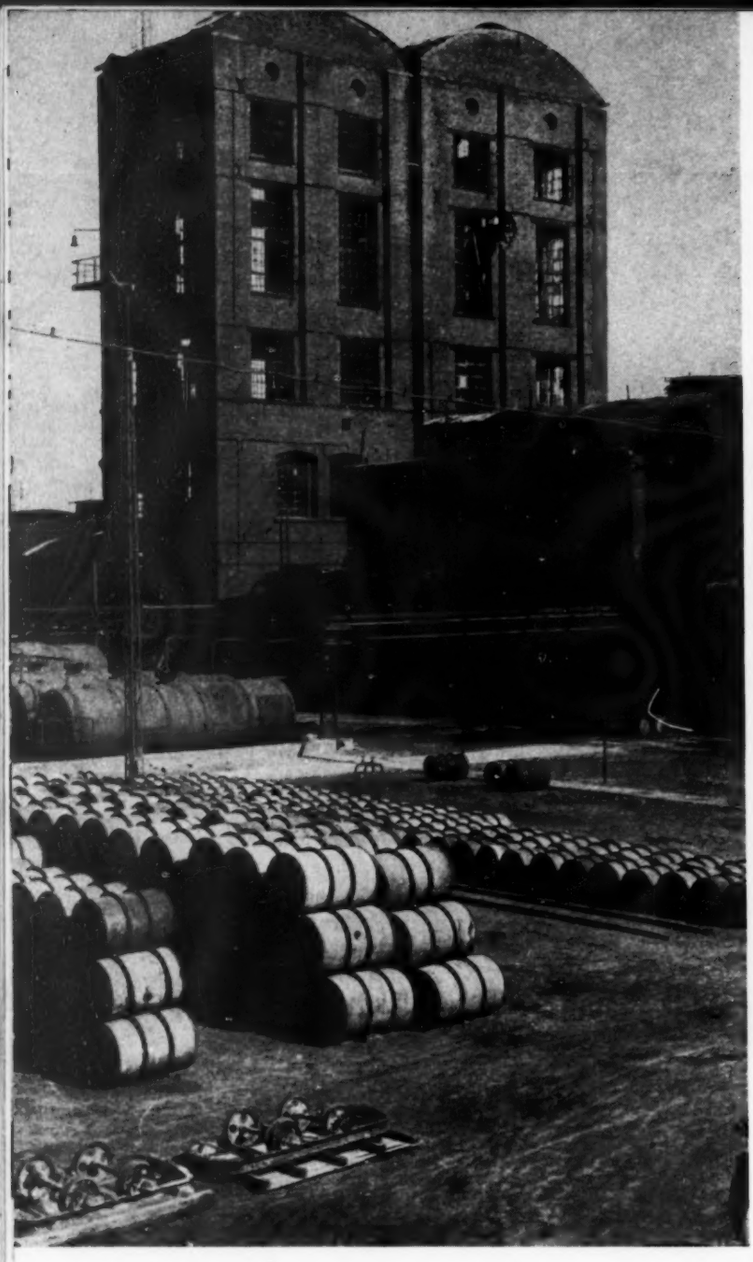
and Emsland. Besides these only Baden and Bavaria have any oil production. The two Badish fields average about 500 tons monthly. Tegernsee in Bavaria delivers a single ton in a month.

Hanover is the oldest German oil district. Some of the fields are more than 70 years old, and most of them are slowly approaching exhaustion. All oil deposits in Hanover are bound to salt domes of which about 200 are known. In fifteen Hanoverian fields the oil has accumulated on the flanks of the salt structures, some of them under salt overhangs, others on axial uplifts formed by the salt movement. Five fields represent the top type. The oil-bearing horizons are mainly of Jurassic and Cretaceous age. Sands and sandstones of the Wealden and Valendis are the widespread oil pays of Hanover, also Dogger sand and sandstones and Upper Jurassic Coral Oolite. Most of the structures are heavily faulted. An exception is the new field, Wesendorf, the best new field in Hanover which has now struck oil in a deeper horizon of Lower Liassic age at 5,500 feet, the deepest oil production of Germany. A curiosity is the oil mining at Wietze carried out by the Deutsche Erdol A. G., which sank two 800-foot shafts with gangways in which the oil beds are drained or the oil sand is mined by the longway system. The mined oil sand is washed out by hot steam in a surface plant. Except for Pechelbronn in Alsace, this is the only active oil mine of the world.

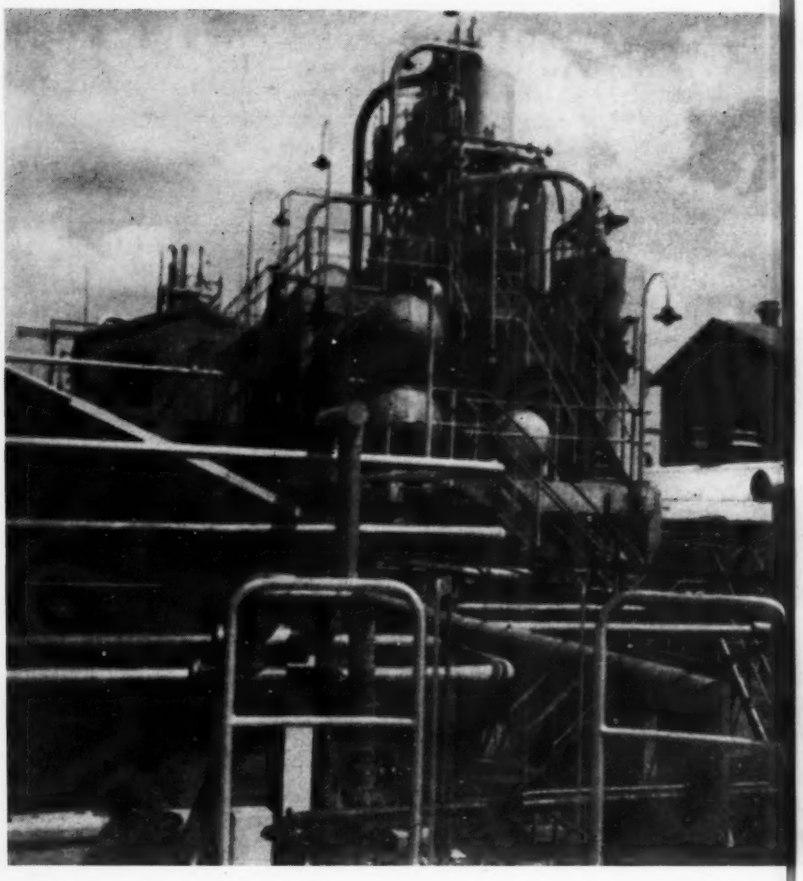
Further wildcatting may be expected to reveal new salt dome fields in Hanover. Generally the Hanoverian salt dome fields afford small production only. Exceptions are Nienhagen and Wesendorf, and only by the discovery of such large fields will the decline in production be stopped. Some good oil traces in wells drilled in recent months may indicate new fields, namely, Stemmer Berg near Hanover, Altencelle and Elite near Hademstorf.

With the beginning of the war the two fields. Heide in Holstein and Reitbrook near Hamburg, being then in the first state of development, were ruthlessly exploited. Especially at Reitbrook every available drop of oil was withdrawn with the result that the gas pressure declined and the wells had to go on pump. The rate of production was subsequently reduced and the field slowly recovered. The Reitbrook pay is of Upper Cretaceous age, a minor oil horizon of Lower Eocene. In Heide oil is gained from the Palaeozoic, Zechstein and Rotliegendes. Schleswig-Holstein as an oil region is not yet fully explored, and it is hoped that further fields may be found in relation to the salt domes and salt trends located by geophysical research.

The oil fields in the Emsland province represent another geological type. They are bound to anticlinical axes and apparently are more productive than the salt dome fields. The best deposit thus far located is situated on both sides of the German-Dutch frontier, the German part called Emlichheim, the Dutch one Schoonebeck or Coevorden. The Emlichheim-Schoonebeck field has an estimated reserve of 3.5 million tons. The Netherlands is claiming as reparations part of the Emsland with Emlichheim and the other German oil fields, Georgsdorf, Lingen and Adorf. Germany, however, stresses the fact that at this place the real reserves for her oil supply are deposited, that the import of oil is impossible due to her shortage of foreign exchange and that it is only because of German research work that



Left: Shell refinery at Russeldorf-Reisholz is operating at full capacity



Deutsche Vacuum refinery at Bremen-Oslebshausen which is in operation again.

oil has been discovered in the Emsland and in the Netherlands too. Oil occurrences in two places, Itterbeck and Apeldorn, may lead to the development of new Emsland fields.

The prospects of finding further oil in Baden are not very promising. Numerous wildcats along the Rhinetal graben proved to be failures. In Bavaria, however, expectations of discovering new fields were reawakened due to the results achieved in the Austrian foreland of the Alps. In Bavaria shallow test programs of the Deutsche Erdol Aktiengesellschaft and the Bayerische Mineral Industrie (Socony-Vacuum affiliate,) are being carried out.

As already mentioned, foreign oil companies have been contributing to the development of German production, namely, the Deutsche Vakuum Oel Aktiengesellschaft (Socony-Vacuum) with production in Nienhagen, Hanigsen, Reitbrook, Oberg, Hademstorf and Steimbke, and the Gewerkschaft Brigitta (Shell and Standard Jersey, 50 percent each) which has nearly all the production of the field Steimbke and some concessions at Fuhrberg and Thoren. In 1939 the share of these two companies in the oil production amounted to 135,144 tons or 18.6 percent. In the first nine months of this year it was 93,686 tons or 21.8 percent of the whole German production. During the war these companies did not get new concessions by the state and, therefore, could not compensate the over-production required during the first years by discoveries in virgin areas. On the other hand, they were not expropriated and dissolved, as was the case in Italy, but were submitted to the regulations of the Feindvermogensordnung (enemy property bill), which were connected with a control carried out by the government.

The most important German companies which participate in oil production are: Gewerkschatf Elwerath, Deutsche Erdel Aktiengesellschaft, Wintershall A. G., Itag and C. Dielmann Berbau G.m.b.H. Shares of some other oil companies are held by the government, namely, Preussag, Schachtbau-Tiefbohrgesellschaft and Braunschweigische Bohrgesselschaft.

German drilling amounted to 84,054 meters in 1933, rose to 209,331 in 1938 and to 233,077 in 1942, declined to 79,676 in 1946 and was 74,599 meters in the first eight months of 1947. This drilling record illustrates the development of oil recovery in Germany.

Before the war Germany possessed numerous efficient refineries which were able not only to supply the German home market with products but also to export products such as lubricating oil, asphalt and special benzenes.

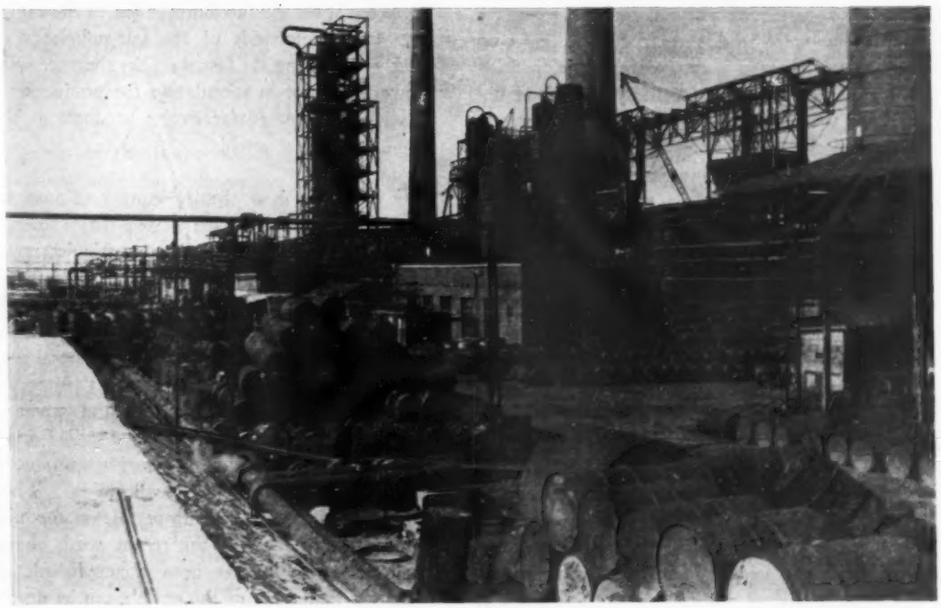
While the oil fields survived the war with little damage, the refineries were heavily bombed, and most of these that were not destroyed had to stop working. Since the war's end, considerable rebuilding has been done. In September, 1947, the plants of the Ebano-Aspalt Werke (Standard Jersey) in Hamburg-Harburg started production with a monthly capacity of 15,000 tons, which will be increased in the future, first to 30,000 and later to 60,000 tons monthly.

In the same vicinity workers are busy rebuilding the Harburg Shell refinery, which after completion will have a monthly output of 36,000 tons. The present state of the German refining capacity and the throughput of 1946 are given as follows:

Present Capacity and 1946 Throughput of German Refineries

Company	Location	Present Annual Capacity—Tons	1946 Annual Throughput
British Occupation Zone:			
1. Production of Fuel and Lubricants with Dewaxing Plant			
Gewerkschaft Deurag-Nerag	Misburg near Hanover	385,000	350,000
Deutsche Vacuum Oel A.G.	Bremen-Oslebshausen	120,000	76,547*
2. Refining of Crude Oil for Special Products (Asphalt, Gasoline)			
Ebano Asphalt-Werke	Hamburg-Harburg	180,000	—
Eurotank	Hamburg-Finkenwarder	180,000	—
Deustche Erdol A.G.	Heide in Holstein	145,000	65,300
Mineralol un Asphaltwerke A.G.	Ostermoor in Holstein	60,000	—
3. Production of Fuel and Lubricants without Dewaxing			
Deutsche Gasolin A.G.	Dollbergen near Peine	100,000	52,000
Deutsche Shell A.G.	Monheim (Rhineland)	80,000	30,800
Deutsche Erdol A.G.	Wietze near Celle	48,000	35,700
Wintershall A.G.	Salzbergen (Emsland)	42,000	29,300
Minerolwerke Peine	Peine in Hanover	20,000	12,400
4. Secondary Refining of Fuel and Lubricating Distillates for Special Products			
Deutsche Shell A.G.	Hamburg-Grasbrook	66,000	32,500
Johann Haltermann	Hamburg, Wilhelmsburg	60,000	18,000
Deutsche Shell A.G.	Dusseldorf-Reisholz	42,000	15,600
Olwerke Julius Schindler G. m. b. H.	Hamburg-Wilhelmsburg	40,000	10,000
Deutsche Vacuum Oel	Wedel in Holstein	36,000	— *
Ernst Schliemanns Olwerke	Hamburg-Grasbrook	24,000	3,900
Deutsche Shell A. G.	Hamburg-Wilhelmsburg	24,000	4,700
Mineralolwerke Albrecht & Co.	Hamburg-Grasbrook	12,000	5,700

* The 1946 throughput of the Wedel refinery is contained in the above figure for the Bremen-Oslebshapsen plant.



As may be seen from the above, the major part of the German refining industry is located near Hamburg; the plants are mostly designed for the manufacture of special products. German crude, which averages a high gravity and a considerable content of paraffin, is especially suited for refining into lubricants. Particulars are stated in the following table:

German Refining Production—Finished Oil Products (In Tons—British Zone Only)

	1946	Eight Months 1947
Gasoline & liquid gas	90,039	45,163
Kerosene	48,967	33,837
Diesel oil	97,169	49,827
Lubricants	191,836	119,786
Asphalt	31,062	26,037
Fuel oil	83,014	70,113
Other Products	58,952	30,843
Total Production	601,039	375,606

Naturally German production cannot meet the requirements of an industrialized country. In 1938 Germany had an annual consumption of 7.2 million tons of finished products. At present the consumption is rigidly restricted and only the most vital industries and priority cases receive fuel allocations. Considerable imports are necessary and more will be needed under the new industry plan intended to make the western zones independent of Allied subsidies. After completion of the rebuilding plan of Standard Jersey and Shell in Hamburg-Harburg, Eurotank in Hamburg-Finkenwarder and Vacuum in Oslebshausen, German refining capacity now amounting to 1,360,000 tons annually will increase to an annual amount of about 2,500,000 tons. The refineries will then be able to cover restricted needs of the western zones. Perhaps Germany will subsequently be able to re-export small quantities of lubricating oil and bitumen as in former times.

Meanwhile the North German Oil Control is considering a plan providing that Germany shall progressively take part in the refining of imported crude. Deliveries from Kuwait are possible to the companies with large sales organizations in Germany, such as Shell, Jersey Standard, Socony-Vacuum and Anglo-Iranian. It is hoped that when this plan becomes effective, Germany will meet her most urgent needs in light products by means of the imported crude. This might make it possible for western Germany, as well as other western European countries which are now rebuilding their refineries, to gain a part of the processing of Middle East crude. Consequently it might then be easier for them to become self-supporting and to restore a normal living standard for their population.

Above—The Neinhagen field is now the largest producer in Germany with an output of more than 11,000 tons per month.

Ebano Asphalt-Werke (New Jersey Standard) refinery at Hamburg-Harburg

SURFACE-ACTIVE AGENTS FROM PETROLEUM

The following article dealing with the development of products to supersede soap was prepared for WORLD PETROLEUM by a member of the research staff of Manchester Oil Refinery Limited, England. This company has been one of the pioneers in the development of surface-active agents through basic research into the relationship between molecular structure and surface activity. The Manchester refinery has contributed a full share of the alleviation of the fat shortage in the United Kingdom, through its commercial production of detergents, and is now increasing its manufacturing capacity for the oil- and water-soluble sulfonates.

THE primary function of industry is to satisfy consumer demand. In the long run the degree of efficiency with which industry meets consumer requirements will be reflected in the profits obtained thereby. However, often the consumer does not know in advance exactly what he wants. On the other hand, the consumer may know very well what he wants but his ignorance of the means by which his need can be satisfied prevents him from giving the necessary directive to industry.

Industry would fail in its duty if it waited on consumer demand to dictate the trend of development; industry has a duty to stimulate demand for the better product and to educate the potential market in the merits of new commodities available as a result of industrial, scientific and engineering progress.

The development of surface-active agents is an excellent example of the combined operations of industry in fulfilling specific consumer needs and, simultaneously, in educating the market in the use of new materials of greater efficiency to replace others of older-established usage.

The oldest-established surface-active agent is soap, of which solutions in water, foam, wet, wash and emulsify. Soap is an astonishing material. It does a lot of things tolerably well, so well, in fact, that it satisfied the demand of the civilized world for a detergent and held the field unchallenged until late in the 19th century.

Early in the 19th century Chevreul and others had established the constitution of soaps. Their work, however, did not lead to a significant replacement of soap in any of its manifold uses for many years, although it did result in the introduction of new raw materials (such as palm and coconut oil) from which conventional soaps might be made.

Probably one reason why, despite Chevreul's work, the development of "synthetic" soaps was neither rapid nor systematic was because knowledge of the chemical constitution of soap formed only half the picture. What was required additionally was some understanding of the phenomena of wetting, detergency and the like, and this understanding has been reached only recently as the result of systematic study.

Nevertheless, many synthetic detergents were produced during the latter half of the 19th century, and, even at that time, both individual and industrial users of soap were aware that conventional soaps had several shortcomings.

The domestic user may be aware of his needs, but sometimes he has difficulty in making known his requirements in a form that can be interpreted in terms of industrial production. However, a large-scale user is more likely to know something of the inner processes involved and to be able to translate his needs into firm requirements acceptable to industry. Soap has a number of disadvantages that have long been recognized: it has poor solubility in cold water, it is ineffective in hard water, and it is decomposed in acid solutions. Such drawbacks were accepted by the small user, but to the growing textile and dyeing industry of the mid-nineteenth century they were serious hindrances to scouring, wetting-out and dyeing processes.

The need had long existed for surface-active agents that were readily water-soluble, gave no sticky scum in hard water, were stable in acids and preferably of higher wetting power and detergency than soap. No real attempt was made to satisfy this need, however, until the textile industry voiced it as a pressing demand. When this demand was voiced, a re-examination was made of various compounds which earlier workers had prepared—out of curiosity or ingenuity—as variants on the soap theme. This re-examination included sulfated olive oil (prepared by Runge in 1834) which proved to be the forerunner of the well-known Turkey Red oil (i.e., sulfated castor oil).

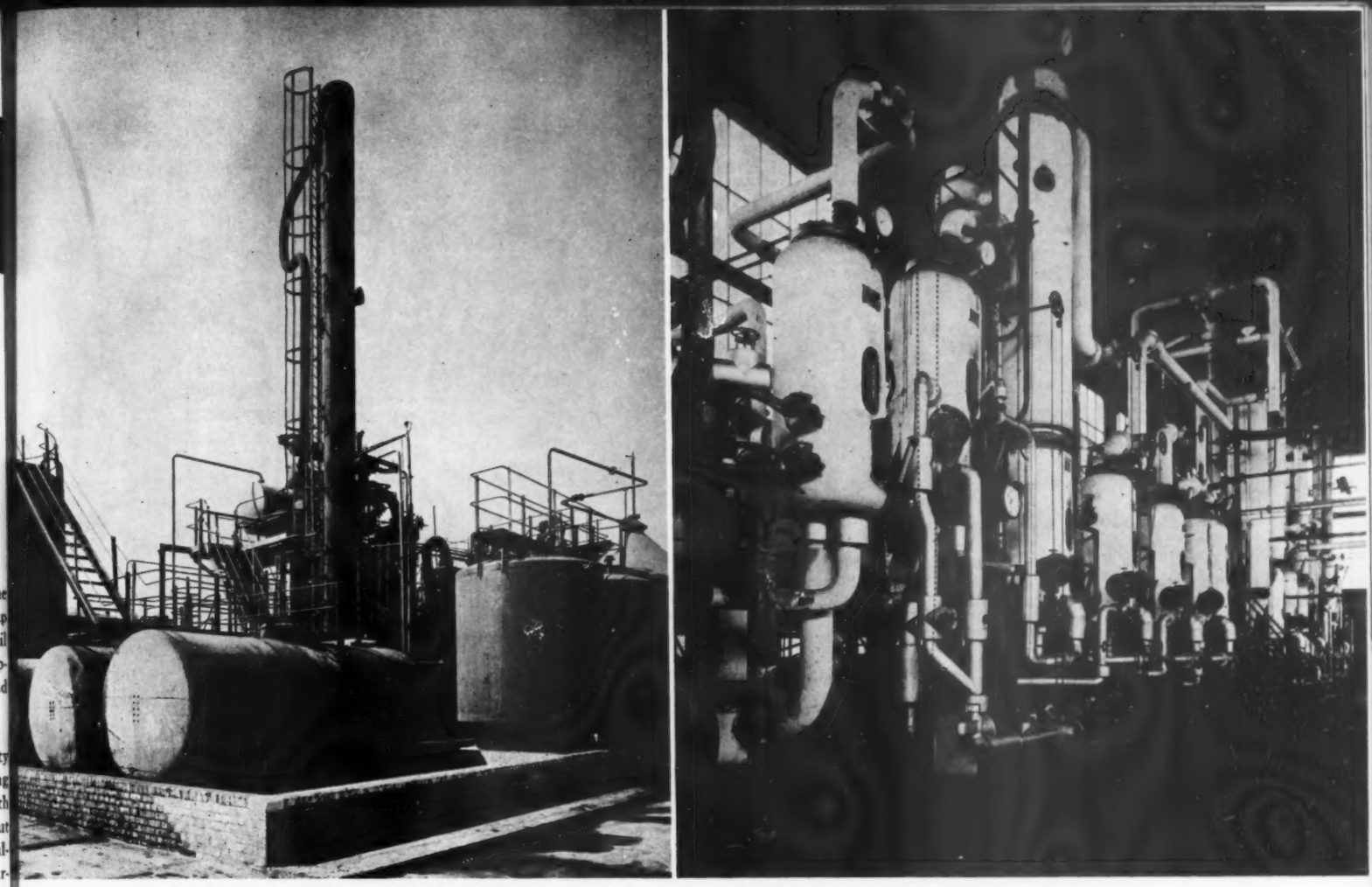
Turkey Red oil, so-called for the brilliancy of dyeing obtained as a result of its use, is principally the di-sodium salt of the sulfuric ester of ricinoleic acid. The wetting properties of the product are good, and it is moderately stable in hard water and acids. Though its detergent and emulsifying powers are inferior to those of soap, its positive properties made Turkey Red oil the first serious challenge to the dominance of soap before the turn of the century. Turkey Red oil has continued, even in the face of later developments, to hold a significant place as a wetting and softening agent for textiles.

A few decades elapsed before the sulfated fatty alcohols entered the field, not only as wetting agents of good stability in hard water and with fair stability in alkaline and acid solutions, but also as detergents. Gardinol, a mixture of sulfates of alcohols from coconut oil, found a market on these merits and in company with similar derivatives (e.g., Dreft) continues to fill a useful need.

Early soapless surface-active agents were mainly produced to satisfy such demands as were not adequately met by soap itself. Another important stimulus to the manufacture of synthetic detergents has been the shortage of fats needed to make soap. In Germany, for instance, between the years 1914 and 1918 the fat shortage provoked the synthesis of the Nekals, aromatic sulfonates with short paraffinic chains.

Between wars the fat shortage led to the numerous I.G. compounds of the self-sufficiency era and, even during the last war, the shortage was a powerful factor in stimulating the production of a wide range of surface-active products in both the old and new worlds.

We have seen how the inadequacy of soap and the shortage of fats each played major roles in fostering the development of synthetic detergents. The third and most potent influence on detergent history was, and still is, the arrival at a proper understanding of the connection between chemical constitution and surface activity. General work on surface activity requires highly integrated production and research facilities, and it was not until the petroleum-chemical and allied industries entered the field of detergent production that these facilities were forthcoming. Therefore, it is in connection with petroleum and allied products that most of the recent work on surface-active agents has been accomplished, and thus the main part of this article can be devoted



Left—Part of the Manchester petroleum sulfonates plant where sodium sulfonates produced during the treatment of white oils are further purified. Alcohol introduced earlier in the process is first removed. Free acids and all traces of organic salts are then removed before the sulfonates are "on grade" and ready for pumping to storage. Right—View of the solvent extraction plant of Manchester Oil Refinery, Ltd.

to petroleum-derived surface-active agents without presenting an unfair picture of the current position.

The most direct petroleum source of surface-active agents is the group of by-products obtained in the manufacture of white oils. In outline white oils are made from raffinates by heavy successive treatment with fuming sulfuric acid. Thereby the more reactive constituents of the oil are removed, and in particular, the more aromatic components are sulfonated. The products of sulfonation are complex, and the constitution and properties of the bodies which are isolated are dependent upon the composition of the original oil and the precise conditions of treatment and selective extraction. The surface-active agents obtained directly from petroleum fractions in this way, fall into two main groups: (a) the oil-soluble sulfonic acids which remain in the oil after oleum treatment and may be extracted therefrom as such or, after neutralization, as their sodium salts; (b) the water-soluble sulfonic acids, which are in the sludge and aqueous phases after acid treatment.

Between 1933 and 1935, von Pilat and his collaborators first investigated the different sulfonic acids that are formed during oleum treatment of raffinates. Later investigations by Manchester Oil Refinery Limited have not only thrown a great deal more light on the constitution of the petroleum sulfonates but have also established important connections between molecular structure and surface activity. The results of this work will shortly be published, but a preliminary summary may be found interesting.

It has been shown that both the oil- and the water-soluble petroleum sulfonates are sulfonated aromatic-naphthenic nuclei to which are attached paraffinic side chains. The length of the alkyl chains has a marked influence in determining whether the compound is oil- or water-soluble. The number of sulfonic groups and the size and form of the molecule affect the hard-water stability. The differences in the molecular size and structure of the compounds can influence significantly the surface-active properties. Such differences are to some extent controllable by the selection of the charge stock and processing conditions.

The petroleum sulfonates, therefore, are being regarded increasingly by the refiner not as chance by-products but as carefully fractionated products for the manufacture of which materials and processes must be selected and controlled to yield surface-active agents of the required applicability. The oil-soluble sulfonates are established as powerful emulsifying agents, effective in acid or alkaline media, though their hard-water stability is low. The water-soluble sulfonates (e.g., Petrosol) are effective wetting and foaming agents of moderate hard-water stability, and their rapidly increasing fields of utility also include, by virtue of their wetting and degreasing properties, certain detergent applications.

Further, in addition to useful by-products, the petroleum industry offers primary products which can serve as raw materials for the manufacture of surface-active agents. It is from sources such as these that the main challenge to soap in its principal market, i.e., for washing purposes, may well arise. These primary products include the waxes which, on cracking, yield olefines. On absorption in sulfuric acid followed by neutralization, secondary alkyl sulfates are obtained which form the essential ingredients in Teepol. The Tergitols, made by a different route, are of similar type. These compounds have very good wetting properties and are stable in hard water, acids and alkalis.

By analogy with the Fischer-Tropsch wax oxidation processes developed in Germany, the petroleum waxes may also serve as starting materials for long-chain fatty acids and alcohols which, on saponification or sulfation respectively, yield detergents. Alternatively, the fatty acids obtained may be condensed with methyl taurine, sarcosine or hydroxy-ethane sulfonic acid to give Igepon T,

Part of the research laboratories of Manchester Oil Refinery, Ltd., where much of the development work has been done on the construction and application of sulfonates for detergents, dispersing agents, emulsifiers and wetting agents.

Medialan A or Igepon A respectively, which were used in Germany principally as detergents and textile auxiliaries. The extent to which these additional petroleum sources of surface-active agents will be called into service will be determined by the economic factors which govern the operation of the Fischer-Tropsch process (or of the United States variant, the synthine process, which employs natural or cracking gases) and by the supply position of natural oils and fats.

Already established within the framework of the petroleum industry and employing a petroleum primary product as an essential raw material is the process for the manufacture on an extensive scale of sulfonates with long side chains—e.g., sodium dodecyl benzene sulfonate—such as the Nacconols. This group of compounds has very good wetting and detergent properties and is stable in hard water, acids and alkalis. In outline the Nacconols are prepared by chlorinating a kerosene fraction, condensing the product with benzene and sulfonating the resulting hydrocarbon.

Alternatively, (as, for example, in the Oronite detergents) the hydrocarbon chain may be obtained by other means. Again, the German process for the manufacture of alkyl sulfonates from a Fischer-Tropsch middle fraction could well be adapted to petroleum fractions. The process is essentially sulfochlorination followed by saponification, by which means agents of good wetting, detergent and emulsifying properties are obtained. Economically, alkyl aryl sulfonates are direct competitors with soap for the household and laundry markets, and expansion of their production is most probable.

A far wider picture is presented when the alkylation, aromatization and cracking processes of the petroleum industry are considered. Such processes yield olefines from which may be prepared ethylene oxide, glycols, alcohols and a wide range of intermediates. Few of the many surface-active agents which recent research and development have provided for general and specialized uses are outside the scope of such processes. Outstanding among these recent synthetics are the sulfosuccinic esters (e.g., sodium dioctylsulfosuccinate—Aersol OT—which has excellent wetting power and high stability to hard water and acids) and the glycol and glycerol ethers and esters, such as Lissapol N and the Tritons.

The structure of these very stable compounds can be precisely controlled to give the desired degree of water- and oil-solubility; their emulsifying power, detergency and wetting power are subject to their chemical design. Further the polyglycol ethers prepared, for example, from polymerized olefines by condensation with phenols and subsequent reaction with ethylene oxide merit attention as excellent detergents and emulsifiers. They may be used as such or sulfonated to give compounds of the Igepal and Alipal types. Within the wider view should be included the cation-action compounds (e.g., Fixanol C-cetyl pyridinium bromide) which the textile industry uses as softening and waterproofing agents.

In the future it is virtually certain that expansion in production and increase in range of usefulness of surface-active agents will be maintained. Though the details of future developments naturally cannot be foreseen clearly, it seems likely that (by virtue of their price and performance) certain of the alkyl benzene sulfonates will be major competitors with soap in the general detergent market. Nowadays essential domestic and industrial processes need not be impeded by the inherent disadvantages of the conventional soaps, while the later synthetics have found applications and brought new benefits in the most diverse fields—including the home, agriculture and textile, paper, leather printing, paint, rubber, plastics and metallurgical industries. Much has been learned of the structural features which give the desirable properties. In the design of the patterns, the construction of compounds of the required molecular shape, the enlightenment of the potential consumer and the meeting of the ultimate demand, it is expected that petroleum and chemical industries will continue to make a significant contribution.

PETROLEUM'S RELATIONSHIP TO NATIONAL SECURITY*

By Bruce K. Brown

OF THE total tonnage moved overseas to win World War II, including men, munitions, food, clothing and weapons, more than sixty percent was petroleum. World War II was truly three-dimensional petroleum-powered air battles over land and sea had a controlling importance, and air power influenced all other strategy. Naval forces, ground forces and air forces alike drew their mechanized power from oil. Despite experimentation on the use of atomic energy to power certain types of naval vessels and possibly aircraft, there is nothing to indicate that petroleum fuels will not have to power any future war so long as we are dependent on present technology or its foreseeable extensions.

Suppose there should be a third world war? What would be the magnitude of the task? What would we be asked to supply? Let us face up to the possibility of having to power another war—which God forbid. It is only a hypothesis.

Regardless of the year when we may have to face another conflict, the answer is bound to be found in the sum of three items:
(1) The peacetime demand then prevalent (including the peacetime consumption of the military,) minus the amount that can be then saved by rationing; plus
(2) The petroleum required for an increased industrial tempo for war production and transportation; and plus
(3) The increase in military requirements due to war, including such supplies needed by allies.

As to the peacetime demand, we know that it is increasing with each year. The total domestic demand for petroleum products in 1937 was 1,180,600,000 barrels, and of this only 0.9 percent was military demand. In 1941 the figure was 1,524,000,000 barrels, and only 2.6 percent represented military demand. The latest estimate for 1947 assumes a total domestic demand of 2,020,000,000 barrels. The military portion of the 1947 demand is 3.1 percent and would have been higher had not the Armed Services relied heavily on war-accumulated stocks. A truer figure for 1947 military demand would have been five percent. We must assume that normal peacetime demand for petroleum is going to increase year by year. Further, we must remember that with each year that passes the increasing use of Diesel fuel by railroads, heating oil in homes and tractor fuel for food production is shifting the balance of civilian usage so that less of it can be classified as "non-essential." For this reason, while a future rationing job might save more barrels per day than were saved by rationing during World War II, it could not save as great a percentage of the total oil used. Thus, supplying the essential civilian demand for petroleum will be a harder job than ever and each year makes it a bigger job.

The second element for consideration, namely, the additional oil required by civilians over normal peacetime consumption to permit maximum war production in the fields of food, manufactured articles, munitions and transportation is increasing roughly in proportion to the degree that peacetime progress imposes new responsibilities on petroleum power.

Finally we have to consider the third element, the increased military demand for petroleum in wartime. Since all naval vessels were oil-powered and ground forces were highly mechanized in World War II, the wartime petroleum demand of the ground and sea forces should still be roughly proportionate to the World War II demand per unit of such armed forces. But not so with the air forces! A P-51 fighter plane of World War II consumed about 65 gallons of 100-octane gasoline per hour. The jet-powered counterpart fighter plane as now developed uses 300-500 gallons of fuel per hour.

Approximately 1,500,000 barrels per day of direct military supplies of petroleum were drawn from the Western Hemisphere during World War II. Over 500,000 barrels per day of this direct military demand was for 100 octane airplane fuel alone. If we were to assume that just as many planes would be needed in another conflict, that they would all be jet powered, that these jet planes would require six times as much fuel per plane per hour as the military planes of World War II, and, finally, that the planes would have to fly just as many hours per day, we could construct a hypothetical direct military requirement of 4,500,000 barrels per day. Add this direct military requirement to the petroleum demand for war production and the probable normal civilian demand for petroleum and you have a tremendous figure.

We cannot contribute to our national security by ducking the probability that our defense strategists are right, not wrong, in their basic assumption that there will be very large military needs for petroleum in any war to come. Rather let us consider what is involved in fueling another war. First, what is it that we do know about the probable requirements of the air forces for petroleum fuel? We know:

(1) That the 100/130 grade aviation gasoline which powered our air fleet in World War II is not good enough to give superior performance in aircraft engines now designed, fabricated, and in use in many of our most modern military planes;
(2) That the military planes of 1947-8 are heavier, larger and require more fuel per hour in flight than their predecessors;
(3) That jet-propelled planes are faster and are needed for that very reason;
(4) That, regardless of their present inefficiency in fuel utilization and regardless of such technological advances as may be made to improve the fuel efficiency of jet-propelled planes, the high speed they attain, which is their principal reason for being, means and will continue to mean more fuel usage per plane;
(5) That the 115/145 grade aviation gasoline required for modern fighter planes is harder to make than the old grade 130 because it requires a greater proportion of synthetic hydrocarbons such as "alkylate."
(6) That every increase in the quality of high octane aircraft fuel appears to reduce the quantity that can be produced in available refineries.

Summarizing these points, we see difficulty ahead whether the air forces stick to high octane gasoline in reciprocating type engines or whether they go over to the use of jet-propelled planes. The new superior grades of high octane gasoline are harder to make, and production of large quantities requires special equipment and implies increased wastage through increased refinery losses. The possibility that jet fuels will be required instead suggests that, because of the higher fuel consumption of jet planes, the problem of supplying sufficient quantities of any specification will be a tough one indeed.

Meeting the demand for very high octane aviation gasoline in the event of war looks like child's play compared to the task of meeting the fuel requirement of a wartime fleet of jet-propelled planes, assuming that each unit would use several times as much petroleum as its World War II counterpart. There is nothing that can be said on the subject from which oil men who may be called upon to fuel another war can draw any feeling of real optimism. Nevertheless, there are some factors from which we can gain encouragemnt. Too often in the past designers intent on forcing maximum power output out of a new engine have designed such a unit around a fuel of close specifications. The 100 octane engine is a case in point. However, the current development of military jet plans is being supervised by authorities who are keenly conscious of the logistical side of the problem. The armed services realize that, from the standpoint of logistics, the ideal jet engine is one that can use as fuel any hodge-podge of light petroleum products available at a bulk plant or terminal. Engine Designers are aiming toward this.

The very fuel-wastefulness of present jet-propelled aircraft rules them out for air transport work, for very long missions and for certain fighter operations at points, such as carriers or isolated islands, where fuel is inherently in short supply. If future technological development cures these deficiencies by making jet-propelled planes or "jet-prop planes" more efficient from the standpoint of fuel consumption and hence more widely useable, a part of our tremendous potential military petroleum supply problem will have been alleviated. Some oil men are incredulous as to the reality of an estimated huge demand for jet fuel in wartime. "Where," they say, "can these planes fly? If they go so fast, the flying hours per mission will surely be cut below World War II standards. Will the fuel demand really be so great after all?" The questions are apt ones and no simple answer could be forthcoming, even if military security permitted. However, it is well to remember that planes move in three dimensions, not two, and that each extension of power and speed multiplies the maneuverable area of combat.

Chemically propelled missiles and rockets may partly supplant piloted airplanes in a future conflict and, to the extent that they do, the demand for petroleum-fueled planes would be reduced. Such a development would at the same time tend to shorten the supply of equipment available to the industry and indirectly would present new hydrocarbon supply problems. Alcohols, nitrates, hydrazine compounds, liquid oxygen and the like have been prominently mentioned as propellants. The logical raw material source for all of these chemicals except oxygen is petroleum in the form of natural gas, and the type of equipment needed for the manufacture of all these substances including oxygen is the same general type of equipment that is needed in refineries and synthetic petroleum plants. The point is, while such propellant chemicals may be more efficient than petroleum, they cannot be produced in large quantities without the use of hydrocarbons and equipment upon which we could otherwise rely for petroleum war production.

I have stressed the potential demand for aircraft fuels because it appears that this would be the area of greatest supply stress. This is not to discount lubricant problems, the toluene, synthetic rubber and chemical problems, nor the recurrence of fuel demands for a multi-ocean navy or legions of mechanized ground armies. But to this known demand we must add a new factor. During World War II there was a real shortage of the "middle - of - the - barrel fractions" of petroleum. The navy's Diesel engines competed with chicken brooders and home heating equipment for the middle distillate fractions. The potential supplies of cracking stocks for gasoline production were restricted by all of these other uses for the kerosene-gas oil fractions. The now increased demands for railroad Diesel fuels, home heating oils and tractor oils would make this competition worse than before.

Thus far I have discussed the question of possible war demands on the petroleum industry without reference to our ability to supply them. Our potential petroleum supplies, in the order of probable volume and probable availability would be drawn from (1) domestic oil, (2) foreign oil, and (3) oil from new synthetic plants. However, I propose to discuss them in reverse order putting synthesis first. Since at the moment there is no actual commercial production of synthetic petroleum for normal uses, all of us can appraise the prospects from the standpoint of national security dispassionately.

Bruce K. Brown

Bruce K. Brown is as familiar as any man in America with the problems faced by the oil industry in World War II. As assistant deputy administrator of the Petroleum Administration for War, he was in the thick of the race to build the magnificent system of 100-octane refineries in time to fuel the war planes of the allied nations. This background enables him to speak with authority in discussing problems which would have to be solved in oiling another war. Mr. Brown is a vice president of Standard Oil Co. (Ind.) in charge of research and development, as well as being president of Pan American Petroleum Corp.

Liquid petroleum can be produced synthetically from raw materials such as natural gas or coal. And it can be obtained by extraction from materials such as shale or tar sands. When and if crude oil becomes sufficiently scarce to justify the necessary steps, all of the liquid hydrocarbon fuels that are needed can be synthesized from gas and coal. Oil industry men have correctly stated this and the public, the Congress and the armed forces believe it. However, this can be brought about painlessly and soundly from the economic sense only if the practical development occurs over a long period of years, and any impression to the contrary is apt to result in a false sense of national security.

The futility of relying on the hurried erection of plants to synthesis petroleum from other natural resources needs analysis. The most likely immediate source of synthetic liquid petroleum is natural gas, and the cost of a plant to produce liquid petroleum from natural gas is currently computed, depending on the authority you consult, at $2,500 to $4,000 per daily barrel of liquid petroleum. This assumes a supply of gas available and ready for delivery to the plants. To produce synthetically only a million barrels a day of petroleum, which is less than one-fifth of our current peacetime needs, would require an investment of multiple billions of dollars. Assuming the economic urge, plenty of construction materials and manpower and a peaceful atmosphere in which to work, such a development may well occur over a period of years.

The difficulty of accomplishing such a program quickly in the middle of a war in the face of other demands on manpower, construction materials and transportation is obvious to everyone who tried to build any industrial plant during World War II.

We can most assuredly synthesize liquid fuels from coal as well as from gas. However, it cannot be done as rapidly or as cheaply. It cannot be done at all unless new mines are opened and staffed with miners yet to be trained. Even in this year of peace we are about as short of coal as we are of oil. Bureau of Mines computations indicate that to produce ten thousand barrels per day of synthetic petroleum from coal of 12-13,000 BTU's per pound would require 6,500 tons of coal daily.

To produce a million barrels of oil a day from coal, that is less than one-fifth of our current peacetime requirement, would require the erection of plants costing, say five billion dollars, and such plants would consume 650,000 tons of coal a day or about 236,000,000 tons per year. The cost of opening new coal mines is estimated at $5 to $8 per annual ton, which would add another billion or so dollars to the estimated cost. The nation's entire production of bituminous coal for 1941 was reported at 511,000,000 tons. To produce all of our present approximate 5,000,000 barrel daily demand for petroleum products from bituminous coal would necessitate, among other fantastic requirements, twice as much bituminous coal as we mined in 1941. Even that enormous production would leave no bituminous coal to be burned as coal. It could properly be said that we ought to use sub-bituminous coal anyway and that if we did, we might get raw materials more cheaply and without competing with other uses for bituminous coal. I can agree with those ideas, but a cold-blooded analysis requires that we stick to known facts. Until we have more and better data on the feasibility of producing the large quantities of sub-bituminous coal economically (that is, economically in manpower, housing, transportation and equipment,) we should base our computations on present known resources and techniques.

The quantities of synthetic fuel that will probably become available through the normal peacetime development of our economy in the next few years will seem very large when measured by the technological achievement involved; and to the extent that the operation is regarded as a chemical synthesis it will give by far the greatest volume of synthetic product ever produced. But measured in terms of our total requirements for liquid fuels, the fraction produced by synthesis is apt to be small for several decades, and its rate of growth will depend on the law of supply and demand. The costs of a forced wartime development as a major substitute for natural

petroleum would be fantastic. The dollars for such a development could be coined, but the manpower, construction material and mining problems would remain.

The prospect of large quantities of oil from shale and tar sands seems slightly more remote than from synthesis. The processes of extraction, particularly in the case of shale, are by no means insoluble, and the construction material costs of plants to extract and refine the products may easily be less. But the mining and handling of the great quantities of materials might create even more serious manpower problems.

It appears that the factors of time, money, materials and manpower — none of which would stymie the long-range peaceful development of fuels to replace crude oil—would be very real obstacles to the sudden wartime augmentation of liquid fuel supplies. It seems evident that if war comes to us again in our time, we shall have to rely mainly on petroleum from domestic sources plus supplies available to us in other friendly countries which we can protect and to which we can maintain sea lanes.

Now what of foreign oil? This is a controversial topic. Unenlightened persons have damned all oil companies alike for even being interested in oil abroad, but the controversial heat thus engendered is mild compared to the temperature rises that occur when foreign oil is discussed within the domestic oil industry itself.

"Oil abroad," say some longhairs, "is a breeder of wars." That is not true. It is not oil that provokes international dissension; it is lack of oil. Further, it is lack of oil that has sometimes lost wars. Damning an oil company for being associated with a commodity described as a breeder of wars is like damning a doctor because he is associated with death. Oil is fuel . . . it is power . . . it is factory production . . . it is transportation . . . it is mechanized agriculture. If every person and every nation had enough of those things, there would be less to fight about.

The Middle East Oil situation is a case in point. There a daily production of about 885,000 barrels is being obtained from 208 wells. Some single wells have produced as much as 3,000,000 barrels per year. Only two dry holes were drilled this year. It has been estimated that production can be doubled by 1953 by drilling only one hundred new wells per year.

Shipment of 480,000 tons of steel to Middle East petroleum operations and the use of the steel in that area for pipelines, gathering lines and new wells would greatly increase the available supply of Mid-East crude and would make hundreds of thousands of barrels per day available in the Mediterranean. Once in the Mediterranean it could be refined or transported to Europe for refining. Opponents of the shipment of such steel argued that our government should block such shipments by exercising export controls. The argument advanced for blocking export was that if the same quantity of steel were kept in the United States, it would provide casing for 14,545 domestic wells of average (3,600 feet) depth and, based on experience, the drilling of such wells would augment domestic production by 300,000 barrels per day. There seems no reason to doubt these figures nor the conclusion that decreasing the already short supply of pipe will retard the development of domestic reserves at a time when we need more oil both for our expanding peaceful economy and as a bulwark to national security. However, when we look at the same question solely from the standpoint of national security, it appears that foregoing the immediate development of additional domestic reserves, evil as it may be, is the lesser of two evils. If Europe is to survive, it will have to get oil from somewhere, and until it can draw more from the Middle East, it will have to continue to drain the Western Hemisphere. In other words, it must continue to drain those very reserves upon which we have to place our main reliance.

The Middle East petroleum situation is only one instance of how policy concerning foreign oil may affect national security. The fact that we were partially dependent on South American oil during World War II is known. The further fact that we were cut off from South American oil partially or completely, until we regained control of the sea lanes, was also well known. The twin facts—that we need to stimulate the domestic producing industry to the fullest extent and that we nevertheless need to import some foreign oil—have been correlated in many enunciations of policy by government bodies and by industry groups with all shades of opinion.

The analysis made thus far of petroleum as it affects national security can be condensed into three items. First, we shall need more petroleum than ever in the event of another war. Second, our supply situation has changed in such a manner that, instead of being a country having an exportable surplus of petroleum and a potential production of one million barrels per day above peacetime needs, we have turned into a country which is on balance a net importer of petroleum. Third, in the event of war within the foreseeable future we should have to place our main reliance on the crude petroleum resources that we have developed or can develop at home or close to home. The departments of National Defense and State comprehend this situation and appear to be shaping their policies to take it into account. But not so with some other agencies and arms of government. This brings me to a criticism of some attitudes of government which make negative contributions to petroleum national security.

Consider the potentiality of developing and producing petroleum reserves in the tidelands areas over which the states had acknowledged and undisputed sovereignty for so many years. I know of no more rapid and certain way to augment our producible petroleum reserves than for Congress to revest in the states the title to those coastal areas. Probably the greatest single opportunity to better our national petroleum reserve situation lies buried in those tidelands areas. The way to keep it buried the longest and make it the least effective bulwark for national defense is for the federal government to assert ownership and seek to supplant the state conservation bodies.

Any person who wishes to argue to the contrary and to assert that federal regulation of oil produced in tideland areas will not retard production should first explain away the relatively low oil production achieved out of federal lands up to now, as contrasted with production out of state lands.

The Department of Justice chose 1947 as the year in which to attack the legality of the unitized operation of plants for separating into its marketable parts natural gasoline or recycle gasoline produced as a by-product of unitized operation of natural gas fields. Unitization of diverse holdings of oil-productive acreage has permitted the rapid, orderly and equitable production of a maximum of petroleum with a minimum of wastage. The filing of this suit has naturally served to retard additional unitizations, just as the tidelands decision practically stopped tidelands exploration and delayed the possibility of tidelands production. In the face of the presently short supply of petroleum and the troubled world, these activities of the federal government have made a negative contribution.

Our wartime armies and navies are now demobilized, but there are certain responsibilities to the armed services which still devolve upon the petroleum industry. The proper discharge of these responsibilities can be a real contribution to national security.

One such responsibility is to supply our military establishment with adequate quantities of petroleum at all times.

The second peacetime responsibility of the industry is to support the efforts of the armed services to establish and maintain qualified reserve personnel to handle petroleum matters. It is not enough that adequate petroleum products be supplied the armed forces. To handle that sixty percent of all the weight of men and material that in World War II was petroleum, required many new types of military and naval units.

As oil men, we must concern ourselves lest the armed services lack special personnel, active and reserve, capable of handling the special petroleum problems we all know exist. But over and above all that we owe it to ourselves as citizens to give such support as we can to the still larger and more perplexing problem which the armed services face in trying to keep their ranks filled on a volunteer basis. Our peacetime navy, for example, while shrunken to hardly more than a tenth of its manpower of two and a half years ago, has to face the problem of recruiting almost two-thirds of its effectives this year in order to stay at its authorized strength. The other services face similar problems, and deserve support.

BRITISH PETROLEUM EQUIPMENT EXPORTS INCREASE 300% OVER PREWAR

PRIOR to the World War, that is in 1937-38, the value of petroleum equipment exported from Great Britain was ten to twelve million pounds sterling per annum. Today the annual export of similar materials is in the neghborhood of forty million pounds. "What proportion of this 300% increase is due to increased prices and what proportion is due to increased quantities cannot at present be ascertained," to quote the words of S. T. Robson, chairman of the Council of British Manufacturers of Petroleum Equipment.

This increase has been achieved during the difficult period of postwar reconstruction and the turn-over from war to peace production and in spite of shortages of steel and other materials, coal and labor; but on the other hand has undoubtedly been helped by the financial situation with regard to dollars. It has also contributed to the easement of world shortage of petroleum equipment in general, due partly to war damage in the Eastern Hemisphere, obsolescence of plant and increased demands for exploitation and refinery equipment brought about by greater world requirements for petroleum products.

A great deal of credit is also due to the Council of British Manufacturers of Petroleum Equipment which is an association for mutual help and exchange of information between the various manufacturers and users of equipment. This association recently sent a fact-finding mission consisting of ten members to the Caribbean area, where they spent three months investigating the scope and possibilities of trade open to British industry in that area, particularly in regard to petroleum equipment, and in the very near future S. T. Robson, chairman of the Council, is himself paying a visit to the Middle East oilfields in Iran, Iraq, Bahrein and Saudi Arabia.

Incidentally it can be said that practically the whole of the equipment for the new pipeline from Kirkuk to Haifa and Tripoli is of British manufacture. Under the auspices of the Council the question of standardization is being very carefully studied. At present 21 committees have been formed and are actively working on the standardization of various types of equipment and materials. Naturally these standards will be mainly based on the already existing and well-tried American standards specifications, with the eventual aim that standard parts can be utilized from either source at will.

Most types of petroleum equipment are now manufactured in Great Brtain of the same type and quality as are already manufactured in the United States, but there are still a few gaps which for one reason or another have not yet been bridged. The equipment being manufactured is competitive, both as to price and quality, with similar equipment being produced in the United States. In some cases U. S. A. goods are preferred and in others British.

Deliveries generally are not good compared with prewar standards, but on an average compare favorably with deliveries of similar material from the United States. Shipping time for some of the British exports due to the destination locality are more favorable than from the U. S. A.

As mentioned there are still gaps in British supplies; in particular one might mention the larger sizes of line pipe. The mills in Britain are not yet equipped to manufacture larger pipe than 16-inch, and so larger pipes, fittings, valves, etc., are not yet available. With the general shortage of steel, it is doubtful whether British manufacturers would feel justified in entering into competition for the supply of this class of material for some time to come, since the demand for such sizes in the eastern hemisphere is not likely to become urgent for some years and it would then probably not be of sufficient magnitude to justify building of manufacturing plants.

High pressure and temperature valves are being manufactured by arrangement with American firms to U. S. A. standards and patterns and are giving equivalent service.

Many firms are manufacturing drillings rigs and tools together with power equipment, but so far few seem to have attempted the fabrication of sheaves and crown blocks. Cable and ropes of all types of material and of excellent quality have been manufactured for some time in Great Britain, and the demand is ahead of supply.

The position is not so good with regard to control instruments, temperature recorders, etc. In the case of this class of goods the petroleum industry with its exacting demands favors the products from the United States. The dollar difficulty may, however, stimulate demand for British products and thus give the makers opportunities for improving their technique.

Manufacturers of non-ferrous tubes for condensers and heat interchangers report satisfactory increases in tonnage.

Makers of chains for drilling rigs state that their tonnage of this type of auxiliary for export is over 100% more than in prewar years.

British pump manufacturers have been faced since the war with the necessity of designing new types of pumps to meet the changing requirements of processing and of moving oil in bulk. Preparation of new designs and tooling up have had the effect of delaying production of pumps in the United Kingdom. In the opinion of one large pump manufacturer the value of exports of pumps will not be fully appreciated until later in 1948 when volume production will be possible.

The greatest increase in export trade appears to be in insulating material, jointing and packing material, drum making plant, filling machines and oil seals. In some of these industries the increases in exports border on the phenomenal. One of the largest manufacturers of jointing material has supplied the following figures of exports based on the year 1938 as 100%:

1939	1943	1944	1945	1946
109%	2428%	2275%	1488%	5135%

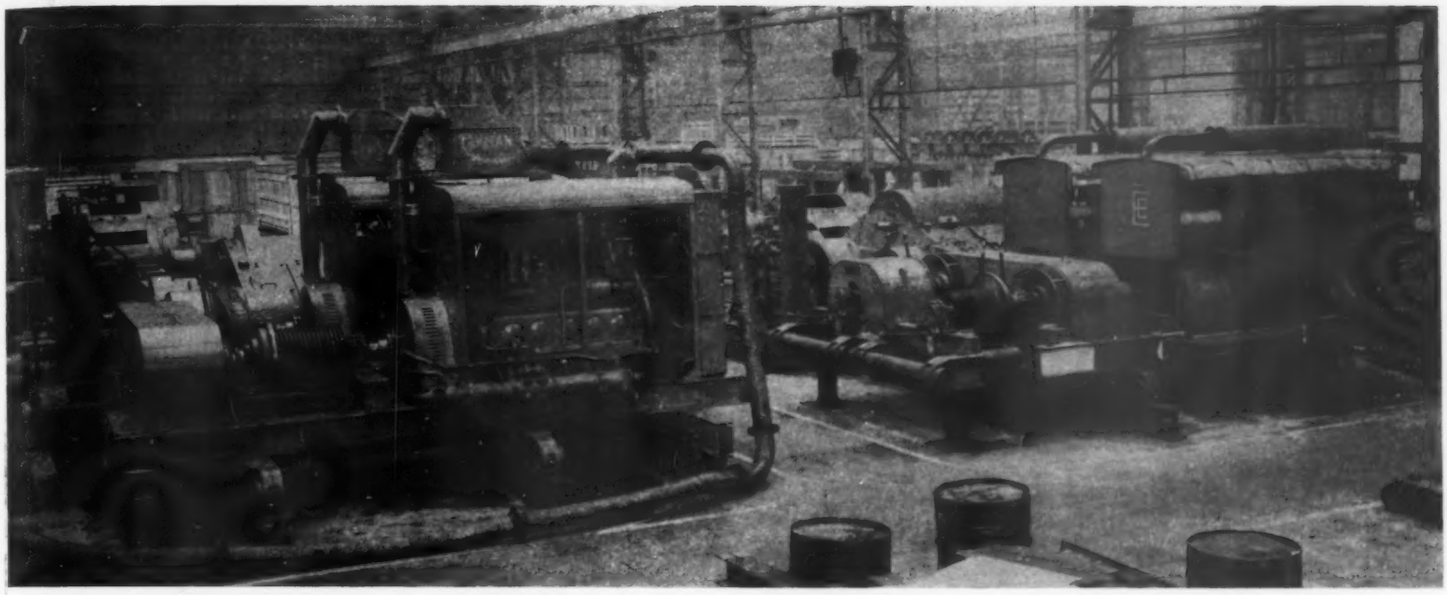
A leading firm of insulation manufacturers inform us that this expansion which is still increasing exceeds their prewar tonnage by 300%.

Makers of sheet metal working machinery for drums report expansion of 50 to 60% as do makers of filling machinery.

Oil well valve cups which were formerly almost all manufactured in America are now being made in Britain. As these were not made there in prewar years, a percentage rise in imports cannot be given; but one firm making them says that its chief concern is to build up production capacity quickly enough to meet the demand.

Council of the Manufacturers' Association recently recommended to the members the establishment of a representative in the Caribbean area with headquarters in Trinidad to supply information regarding British equipment and to receive suggestions as to its adaptation to particular conditions. It was pointed out that American firms place special importance on this kind of personal contact, not only in promoting sales but also by aiding the installation and servicing of equipment and in discussing with oil operators their problems in the field.

At a recent district meeting in Manchester attended by some sixty manufacturers, it was stated that orders placed by British oil companies with British manufacturing firms for specialized



Two Ideal type 50 Consolidated draw works, one driven by Davey Paxman diesel engines, and the other driven by two English electric diesel engines, both running on test in the factory.

Below: View of the Ferodo plant, covering 8-acres, which produces the largest volume of friction materials in the Eastern Hemisphere.

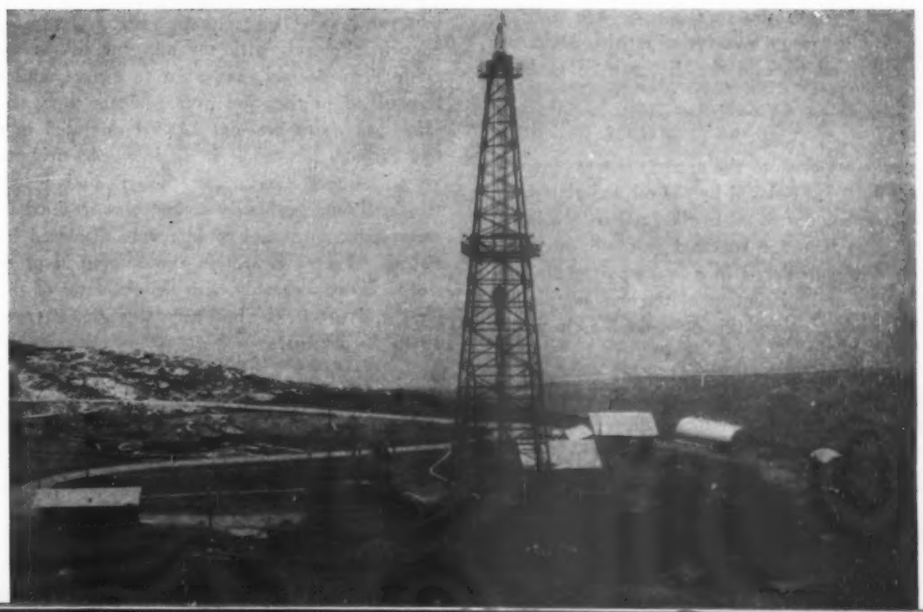
Bottom: An outfit recently erected in the Middle East, equipped with Ideal 100 Consolidated draw works, Paxman engines and complete Ideal equipment made at Stockport. Derrick and structural work supplied by the Oil Well Engineering Co.

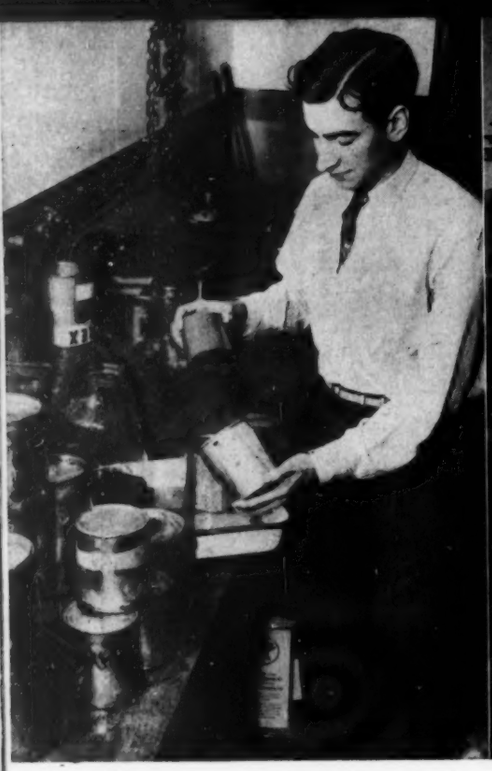
petroleum equipment for use overseas during the first nine months of 1947 amounted to more than £26 million as compared with £30 million for the whole of 1946. John Oriel, chairman of the petroleum industry committee of the British Standards Institution in addressing the meeting emphasized the importance of standards of quality and fitness for performance, dimensional standards, standard methods of sampling and certification and uniformity of definitions and symbols. He urged that British manufacturers follow the API standards accepted by the great majority of the petroleum industry.

Characterizing the oil equipment industry as the soundest export business in the world, Niels Matheson of British Oilfield Equipment Co., Ltd., outlined the various factors which assure a continuous growth in demand for years to come and suggested practical means of approach by which British equipment manufacturers could increase their volume of orders from this field. The meeting adopted a resolution for the organization of a regional committee to further the manufacture of petroleum equipment in the Manchester area.

A conspicuous example of British specialization in oilfield equipment is that of Oil Well Engineering Company. It has been engaged in this line of manufacture for 37 years and in that time has supplied drilling machinery to some of the leading British companies engaged in international operations. The company is affiliated with National Supply Corporation of the United States and fabricates its well-known line of draw works, derricks, rotaries, tool joints, wellhead equipment, drilling and fishing tools. During the war the company was engaged in war work, but early in 1946 it reverted to the production of drilling equipment, including Type 50 and 100 rigs diesel-engined by British-made engines fitted with Vulcan-Sinclair fluid couplings.

It will thus be seen that considerable advance has generally been made by British manufac- the petroleum industry.





Andre Wilkins, Jr., removing cores from cans of lubricating oil in which they were transported to the laboratory.

Research physicist W. J. Leas cutting core sample with diamond core drill. Sample is cut to correspond with direction of flow of oil.

W. D. Rose, Jr., research chemist, lifting a core for testing from the larger core. The cut is made in the direction of the flow of fluid through the rock.

RESTORED STATE TECHNIQUE

THREE years of intensive application by the research division of Carter Oil Company, following a long series of studies carried on in other oil company laboratories, have resulted in the development of methods and apparatus that represent an important step forward in reservoir engineering. It makes possible by laboratory treatment of cores taken from oil-bearing strata the reproduction of conditions practically identical with those existing before the sample was removed from the original location far below the earth's surface.

Using the equipment devised by Carter's experts, engineers now are able to take a rock core from the producing section of a wildcat well, remove the crude with a solvent, saturate the core with water, and, in the laboratory displace much of the water from the core just as the original water underground was forced out by the invading crude oil back in the dim past of geologic time.

A gauge attached to the apparatus measures the water as it is displaced by the oil and thus indicates the amount of oil in the total core volume. The cores then are removed from the displacement cell and placed in a water extractor and the water and oil content of the core sample determined by analysis, giving a double check.

As a result some of the guess-work involved in reservoir engineering is eliminated. This method of water measurement can be used to determine the oil in some definite sub-division of a reservoir, or in the reservoir as a whole, if the core samples tested are sufficiently well distributed.

Aided by this information engineers are able to predict within a narrow margin of error just how much oil is contained in the reservoir.

Because they restore the core to its original condition before it was disturbed by the drill bit, the method has been titled "the restored state technique."

In this restored state the core contains some water which could not be forced out by the oil, just as it contained a certain percentage of water along with the oil underground. This water commonly is called connate water. Its presence in the rock with the oil generally is attributed to the fact that, prior to the accumulation of oil in the sand over geologic time, the sand was water bearing. As oil migrated into and through the sands, it displaced the original water content except for the residual water which, through capillary action, was retained in the smaller pores and could not be displaced by the oil. Water saturation encountered in practice varies considerably with the character of the sand and the fluids, but generally ranges from 10 to 40 percent.

The apparatus is used primarily for analysis of water in cores, but a fairly sizable experimental program is under way utilizing "restored state" core apparatus for other tests.

By using the equipment in reverse fashion to the method followed in determining connate water content, engineers can predict how much of the oil in place can be recovered by gas or water drive.

Thus economic spacing of drilling and sound production methods can be employed with resultant benefit to operators, land owners, royalty owners and the general public.

Cores also are being prepared by "the restored state technique" for use in relative permeability tests, and it is planned to prepare cores in this way for gravitational segregation experiments.

"The restored state technique" makes it possible to conduct almost any kind of experiment on the behavior of oil and gas in porous rock with the connate water in place as it was in the reservoir. The absence of this connate water in previous experimental work has limited the usefulness of most experiments on the behavior of fluids in sands. The technique also is used as an aid in electric log interpretation.

Before laboratory tests on cores can begin, steps must be taken to assure satisfactory material for the experiments.

As the cores are cut and brought to the surface, they are promptly sealed in cans filled with ordinary lubricating oil. This is done because it has been found that air reacts with certain constituents in crude oil to produce grayish or whitish solids which do not dissolve in either oil or water. If allowed to form in the pores, these

• Condensed from The Link, Carter Oil Company, June, 1947.

Miss Frieda Ann Jones, Carter chemist, inserts numbered core in a solvent in preparation for removal of crude oil.

Dr. P. S. Williams, director of Carter's research laboratory, inspects apparatus which literally vacuum cleans cores for later tests.

Dr. W. D. Bruce, director of exploitation research section, taking a reading during extraction of oil from the core.

REPRODUCES RESERVOIR CONDITIONS*

solids might affect the results of later experiments.

In the laboratory the cans are opened and the cores are clamped one by one beneath a one-inch diamond core drill which cuts out a small piece of rock from the side of the core as close to the direction of the flow of the oil through the reservoir rock as possible. Numbered to correspond with the core from which it is taken, the smaller piece of rock then is made flat on one face with a wet carborundum wheel or metal polish wheel.

Then, using a solvent and apparatus developed at the laboratory, the core literally is vacuum cleaned to remove all crude oil. It then is saturated with oil field brine as nearly identical to the connate water as possible, and the water in turn is forced out of the core by surrounding it with oil under pressure. The oil used is taken from the reservoir or as nearly identical to it as possible. An ultra-fine porous glass disk is placed in the bottom of a funnel in the apparatus, and the core is placed on top of this disk with several layers of filter paper between the disk and the core. The paper allows passage of water but prevents the escape of oil because of the small diameter of its pores.

The core then is held in place by a spring which is compressed by a plastic stopper in the top of the funnel. Crude oil from the reservoir under several pounds of pressure then is introduced into the funnel through a tube. As the pressure is increased, a point finally is reached after several days after which there is no appreciable reduction in water saturation.

The crude glass funnel apparatus now has been replaced by new metal and plastic multi-core displacement cells capable of handling nine or more cores at a time and enabling the operator to test core samples from a larger area at one time.

It is believed that as oil migrates underground into a water-filled formation, it displaces the water from the formation, just as the water was displaced from core fragments in the experiment described above. The displacement pressure underground is provided by the difference in density between the invading oil and the water originally in place.

Theoretical study indicated that in the major part of most petroleum reservoirs, the water found in place when the reservoir first is tapped should be equivalent to the minimum water remaining in a core taken from the reservoir and restored according to the technique described in the experiment.

The distribution of the water and oil in the native rock probably is a function of four factors:

(1) The tension between the surfaces of the oil and water.
(2) The general size and shape of the capillaries or openings making up the porous rock.
(3) The direction of fluid displacement.
(4) The texture of the rock forming the capillary wells or openings.

In a study to determine connate water for a reservoir, 10 to 20 cores are chosen to represent a wide selection of the various rock classifications likely to be encountered in the reservoir.

Previously results comparable to those obtained by "the restored state technique" were received from cores obtained with an oil-base drilling fluid.

Common usage has made it necessary for laboratories to report connate water as percent of pore volume. Actually the engineers want to know the percent of bulk core volume filled with oil, so that total oil can be computed directly from the acre feet of oil section. Connate water then is the laboratory yardstick whereby the oil in place can be determined or vice versa.

Commercial core laboratories now are using the Carter-developed apparatus to provide up-to-date core service for the oil industry in general.

Applications of the new method will be many. It provides new guides along economic lines, for it gives a more accurate estimate than oil men ever have had as to how much oil may be in a new pool—and thus how much time and money its development may be worth. With other techniques now in use, it will help production men to decide how best to operate a reservoir for the highest yield, now and later. Already the first complete set of the new equipment is being used by scientists of Creole Petroleum Corporation in Venezuela.

International News and Notes

Robert I. Watson

AFTER being connected with the petroleum industry of the Far East for nearly half a century, Robert I. Watson retired from the chairmanship of Burmah Oil Co., Ltd., on December 31. His first experience in the industry was when he joined the petroleum department of Messrs. Findlay, Flemming & Co., East Indian merchants, who for many years were agents for the Burmah Oil Company. The Burmah Company was registered in 1902 and Mr. Watson has served it during the whole of its existence and has helped to build up a record which expanded without check until 1942 when its refineries and field installations were destroyed by military order when Japan entered World War II.

Mr. Watson left the East in 1912 to join the London staff of the company. He was one of the original directors of the United British Oilfields of Trinidad, Ltd., registered in 1913. He joined the London board of the Burmah Oil Co. in 1918 and in the following year was elected to the main board. He became managing director of the company in 1919 and followed Sir John Cargill, Bart., as chairman in 1944 when he was director of over 20 companies connected with the petroleum industry.

Mr. Watson is recognized throughout the oil industry as a man of exceptional ability, and he is credited with a leading part in the growth of the companies with which he has been associated. An indefatigable worker but of unfailing courtesy, he is followed into his well-deserved retirement by the good wishes of many friends in all parts of the oil industry.

G. C. K. DUNSTERVILLE, who has been in charge of Shell operations in Colombia, has been transferred to Venezuela. He is succeeded by Stewart Tait, a petroleum engineer with broad technical experience in the Shell organization.

Creole Suspends Guarico Exploration

After investing $12,000,000 in exploration in the State of Guarico, Venezuela, the Creole Petroleum Corporation has decided to close its Carrizal camp near El Sombrero according to a statement by President Arthur T. Proudfit. This was the largest exploratory operation of the company in Venezuela, and the decision to suspend operations was made because no commercial production has resulted from three years of intensive effort. It does not involve the abandonment of exploration in this area. Seventy-five percent of the Barbacoas concession will be returned to the government. The remaining twenty-five percent will be retained for future development, and a number of wildcats will be drilled when materials and equipment are more readily available. The Carrizal employees are being assigned to other fields in Venezuela.

Bahamas Survey Completed

Survey of approximately 85,000 square miles of land and water areas in and around the Bahama Islands, which was begun in May, 1947, was completed on November 29. This is the largest survey thus far made by use of the air-borne magnetometer. It was conducted by the Aero Service Corporation for a group of oil companies which hold concessions in the region covered. These companies are Bahamas Exploration Co., Ltd., (Gulf Oil Corporation); Standard Oil Co. (Bahamas) Ltd., (Standard Oil Co., N. J.); Shell Co. of Bahamas, Ltd., (Shell Oil Co.); Bahamas Oil Co., Ltd. (Superior Oil Co.); Anglo-Bahamian Oil, Ltd. (Anglo-Iranian Oil Co. Ltd.)

Douglas DC-3 planes equipped with special recording instruments and towing the flying magnetometer were used in making the survey. Aero Service Corporation's crew numbered about 35 engineers, technicians and flying personnel. Overseas Navigation Co. which operated Shoran mark-ships to guide the surveys, employed a staff of about 30. Over four miles of recording tape were filled by survey records and 20,000 manhours will be required to translate the recorded data into precise magnetic maps for the use of the oil companies' geologists.

Venezuelan Production

Production of crude oil in Venezuela for the month of October, 1947, amounted to 38,409,558 barrels. This was an average of 1,239,018 barrels daily, a gain of 8,034 barrels daily over September. Exports for October were 34,771,258 barrels. Production by companies was as follows:

Company	West	East	Total
Creole	13,976,349	4,754,804	18,731,153
Mene Grande	1,801,321	4,682,113	6,843,434
Shell	11,190,001	—	11,190,001
Consolidada	—	636,601	636,601
Socony	—	928,187	928,187
Texas	195,430	192,332	387,762
S. A. P. Las Mercedes	—	1,333	1,333
B. C. O.	39,485	—	39,485
Orinoco	7,809	—	7,809
Phillips	—	755	755
Varco	—	3,038	3,038
Guasare	—	—	—
Total	27,210,395	11,199,163	38,409,558

Britain's First Producer

In an article published in the September number of WORLD PETROLEUM dealing with drilling in Great Britain under the Petroleum (Production) Act of 1934, the statement was made that the first producing well put down under the terms of this act was drilled by D'Arcy Exploration Company. While this is correct so far as commercial production is concerned, it is pointed out in the interest of historical accuracy that the first actual showing of oil during this period was obtained by Anglo-American Oil Co., Ltd., from its Midlothian No. 1, completed in 1938 for 10 barrels per day and still yielding small quantities.

Peron Urges State Control

President Juan Peron's statement on the fortieth anniversary of the discovery of oil in Argentina, which was observed on Dec. 13 last, is regarded as another move toward nationalization of the Argentine oil industry. One passage in the President's declaration said, "When the State recovers direct management of its resources, it must not be deprived of the privilege of operating them without sharing them with interests that are not entirely Argentinian." No immediate change in the organization of the oil industry is anticipated. The utterance is regarded as merely a move in the consistent policy of constricting the operations of foreign-owned companies in Argentina.

Seize Romanian Plants

Dispatches from Bucharest state that the Romanian government has seized the plants of Astra Romana and Unirea on charges of "bad faith, deficient production and theft of oil from government-owned subsoil." The two companies are British-owned. Astra Romana is a subsidiary of Royal Dutch-Shell, and Unirea is owned by Phoenix Oil & Transport Company. In oil trade circles the charges brought against the companies are regarded as a flimsy pretext on the part of the Communist government to get control.

Exploratory Drilling in Middle East

Affiliates of Iraq Petroleum Company are pushing exploratory work on their concessions in the Middle East. Among the most important developments as far as early results are concerned is the drilling of additional wells by Petroleum Development (Qatar) Ltd., intended to increase production in the Dukhan field to an extent that will justify the establishment of regular transport facilities. In the wildcat class are the wells of Lebanon Petroleum Company north of Aleppo. Further tests will follow in Syria at Dolaa and Abba. Sites have been selected for two or three tests on Basrah Petroleum Company's holdings in Iraq. Petroleum Development (Palestine) Ltd. has begun the boring of a well near Gaza and intends to follow with a test at Kornub in 1948.

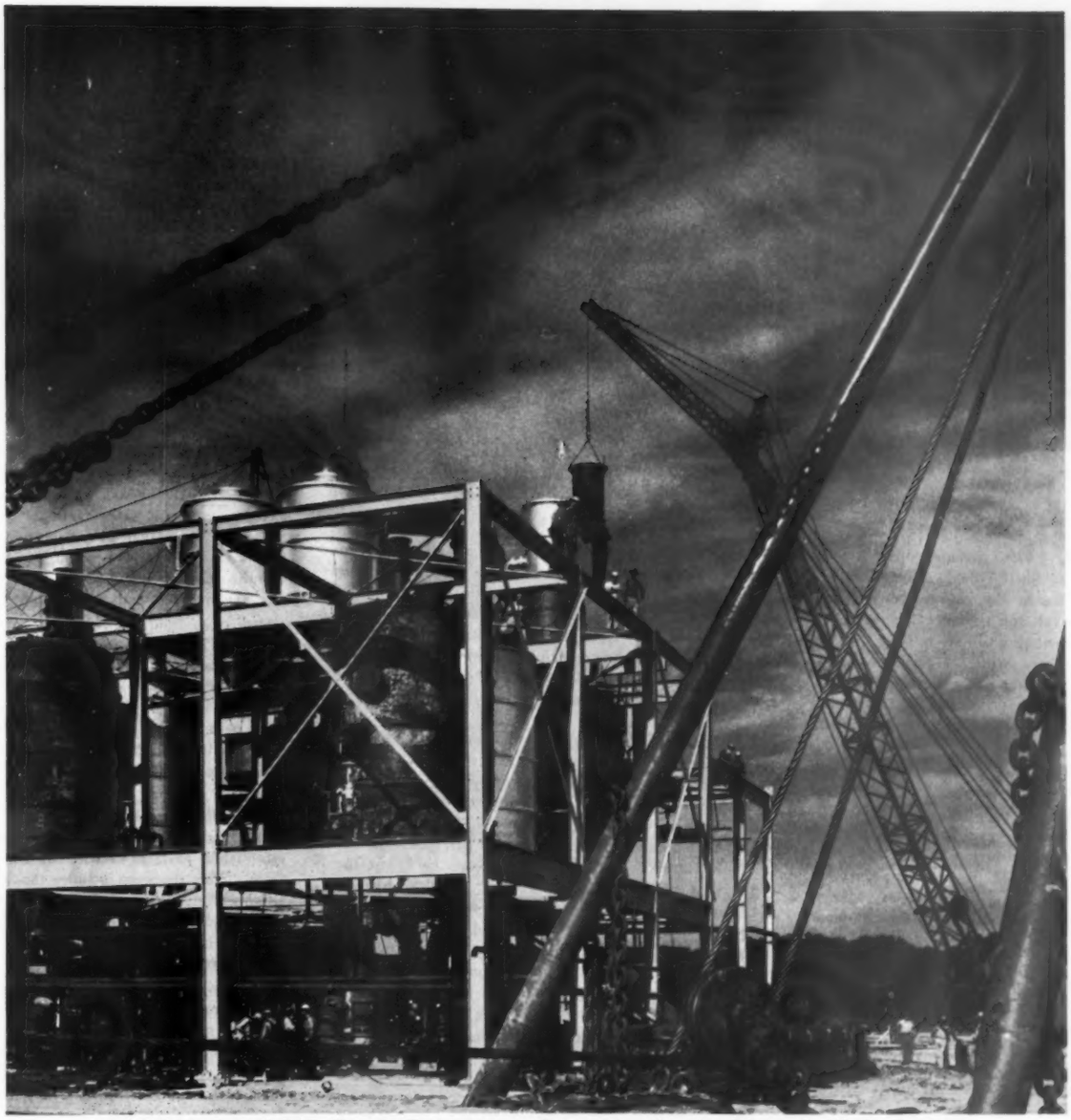
Appoint New Chief Draughtsman

Messrs. G. & J. Weir, Ltd., Cathcart, Glasgow, announce the appointment of D. C. Hagen as their chief draughtsman as from November 3, 1947. Mr. Hagen time he has had wide experience in every branch of has been 36 years with the firm, and during this the firm's activities.

Evans To Head Institute

The Institute of Petroleum announces that E. A. Evans, M. I. Mech. E., F. Inst. Petr., has been nominated as president designate of the Institute for the session 1948-9. Mr. Evans, who has been chief chemist to the Wakefield group of companies since 1915, is well-known in the field of lubrication. He has also been chairman of the Motor Industry Research Association since its inception in March 1946. He was chairman of its predecessor, the Automobile Research Committee, during 1944 and 1945 and chairman of its research subcommittee from 1941 to 1943. In 1942-3 he was awarded the Crompton Medal of the IAE for his paper on Extreme Pressure Lubrication.

E. A. Evans



Nickel-lined steel 50% Caustic Evaporator under construction for Diamond Alkali Company

The $12,000,000 Diamond Alkali Job

Chemical plants, such as the Houston Works of the Diamond Alkali Company, are a specialty of Brown & Root, Inc. We are engineering and erecting this vast and ultra-modern plant and will deliver it in production of caustic soda and chlorine. *Thanks to Industrial & Engineering Chemistry for this picture, which they used as a front cover illustration.*

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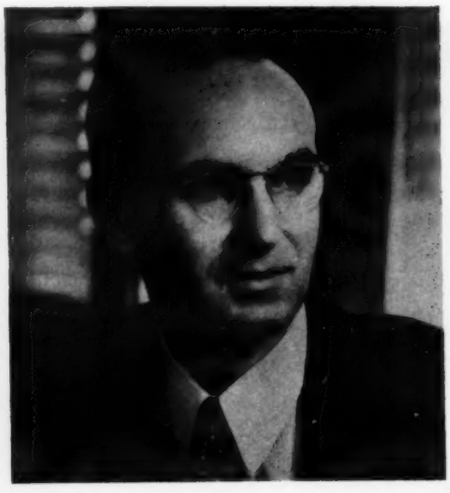
OIL COMPANY STAFF CHANGES

H. Bloemgarten



A. J. Galloway

H. BLOEMGARTEN, vice president of exploration and production of Shell Oil Co., Inc., was appointed managing director in charge of technical operations of the Royal-Dutch Shell Companies on Jan. 1. His headquarters will be at The Hague. Mr. Bloemgarten has been with the Shell organization over 25 years. In 1935 he was appointed vice president in charge of production in St. Louis, and since 1942 he has made his headquarters in New York.

A. J. Galloway, regional vice president of the Shell Oil Co. in Houston, has been appointed vice president in charge of exploration and production, replacing Mr. Bloemgarten. Mr. Galloway joined Shell in 1926 as an assistant geologist in California and in 1934 was made vice president of the Shell Petroleum Corp. in St. Louis. He moved to Houston in 1940 as regional vice president of the Texas-Gulf and Mid-Continent areas.

E. D. Cumming, manager of Shell's American department in London, will succeed Mr. Galloway in Houston. Mr. Cumming spent the early part of his career in technical positions with the company on the Pacific coast. He has served as both technical assistant and manager of Shell refineries at Wilmington and Martinez, Calif. In 1938 he became manager of Shell's Wood River, Ill., refinery, and in 1939 vice president in charge of manufacturing. During the war he served as director of refining for PAW. He was made vice president in charge of exploration and production of the Pacific coast area Oct. 1, 1944, remaining in that position until Oct. 31, 1946, when he went into Shell service overseas.

EARLE WALL, formerly division exploration superintendent for the California Co., southern division, New Orleans, has been transferred to San Francisco in a staff capacity in the office of Gage Lund, chairman of the board of the California Company and of Standard of Texas. Mr. Wall will follow exploration and production activities of those two companies. He has been with the company since 1919 and has served as a geologist and in other exploration capacities in both domestic and foreign operations.

CHARLES RAYNER, formerly petroleum advisor in the State Department, has joined the American Independent Oil Co. He will have charge of the eastern offices that have been opened in the Commonwealth Building, Washington, D. C. Mr. Rayner participated in the planning and negotiation of the Anglo-American Oil Agreement, serving as a member of the President's Oil Committee and as a member of the American delegation that met with the British in London in 1945 in connection with these negotiations. Throughout the war years Mr. Rayner served as chairman of the Enemy Oil Committee, an organization created by the Joint Chiefs of Staff to evaluate the enemy oil potential.

T. S. JOHNSTON has been appointed assistant to the vice president of supply and transportation for Imperial Oil, Ltd. Until recently he was manager of Imperial's marine department. He has been succeeded in that position by Capt. W. R. Smeltzer, his former assistant. Born in Sarnia, Mr. Johnston began his marine operations career when he joined the Standard Shipping Co. in 1928. In 1941 he became assistant manager of the Lago Oil and Transport Co. and the following year was loaned to the Standard Vacuum Co. as assistant manager of their marine operations. In 1944 Mr. Johnston went to South America to study equipment on the Magdalena River in Colombia. Returning to Canada in 1945, he was appointed assistant manager of the marine department, becoming manager a year later.

F. G. Cottle has been appointed manager of the recently-formed supply department of Imperial Oil, Ltd. The department has been created by the division of the former supply and economics department, of which Mr. Cottle has been manager since 1945, into two separate departments. He joined Imperial in 1945 after several years of government service.

W. O. Twaits has been appointed manager of the newly-formed coordination and economics department. He joined Imperial at the Sarnia refinery in 1933. In the spring of 1945 he moved to Toronto and was assistant manager of the supply and economics department until his recent appointment.

EUGENE F. McCABE, general sales manager of the eastern division sales department of Tide Water Associated Oil Co., has been appointed a vice president of the company, according to announcement made by William F. Humphrey. He will continue in charge of the company's eastern division sales department.

GEORGE E. REESE has been appointed chief chemist at Sun Oil Company's Marcus Hook refinery. He succeeds Edward M. Hughes, chief chemist since 1919, who has been appointed to the newly-created position of consultant chemist. Theodore R. McClure will succeed Mr. Reese as assistant chief chemist. Mr. Reese joined Sun in 1924 and was named assistant chief chemist in 1939.

FREDERICK S. LOTT, assistant chief of the petroleum economics division of the U. S. Bureau of Mines for the past five years, has been made chief of the division. He succeeds Alfred G. White, chief since 1936. Because of the current critical petroleum situation, Mr. White will devote full time to forecasts of petroleum demands.

DR. FRANK J. SODAY has been appointed director of research of Lion Oil Co. During World War II Dr. Soday was technical director for the Copolymer Corp., Baton Rouge, La.

THOMAS F. McGAREY has been elected senior vice president and a director of Petrol Corp. of Philadelphia. He has served in executive positions with both independent and major oil companies in the East during the past eighteen years, his most recent connection being vice president and general manager of Climate Control Products Co. in Newark, New Jersey.

H. E. BRAMSTON-COOK has been appointed general manager of eastern operations for Oronite Chemical Co., Standard of California subsidiary. He has been general sales manager for the past year. In his new position Mr. Bramston-Cook will supervise both sales and product development work for Oronite east of the Rockies and foreign operations. His headquarters will be in New York.

T. A. ATKINSON, for the past three years assistant superintendent of the southern division of General Petroleum's production department, has been named assistant manager of the company's industrial relations department. He joined the company in 1935 as a well puller and has occupied various positions in the production department.

WALTER L. McCLOY, JR., has been appointed superintendent of production operations for the newly-established eastern division of Standard Oil Co. of Ohio. This division includes the states of Michigan, Illinois, Kentucky and Indiana. He will continue to have his headquarters in Cleveland.

DR. ARTHUR B. HERSBERGER has been appointed manager of the chemical products division of The Atlantic Refining Co. This recently-organized division will have the responsibility of coordinating company activity in the fields of chemical research, chemical manufacturing and chemical sales. Dr. Hersberger has served with Atlantic's research and development department since 1936.

Dr. A. B. Hersberger

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DEMAND CHALLENGES OIL INDUSTRY

By William R. Boyd, Jr.

President, American Petroleum Institute

WORLD WAR II disrupted the achievement pattern of the world's basic industries. Into the voracious mouth of the god of destruction, humanity tossed its men, its houses, its materials, its oil, its steel—and what is of vastly greater importance—its time.

Industry in America has had many tests of its strength. It has survived struggles with adversity and has never asked for quarter. Today's problem is not one of ability but of time.

The American petroleum industry bears with every other great production force in this country today the tremendous pressure of time. With five years of normal progress swept away by the back-handed impact of the war, this industry, like all of us individually, finds itself in a world where pent-up needs and demands have grown prodigally while its energies and substance were being spent in service.

During 1947 American oil men have striven to meet requirements for their products amounting to 246 million gallons a day. This figure represents more than 30 percent increase over that recorded for 1941, the last year in which the industry supplied a primarily civilian market.

For the record, this is what some of the ablest men in the oil industry are thinking of the pattern for 1948. I append their figures:

U. S. Demand for Petroleum Products
(Millions of Gallons Daily)

	1948 Estimated Demand	% over 1947	% over 1945
Gasoline	102	5.9	13.1
Kerosene	13	7.3	45.1
Distillate fuels	41	10.0	37.1
Residual fuels	62	2.2	—
Others	42	5.0	23.8
All Oils	260	5.6	15.6

These supply and demand figures greatly exceed any recorded in the annals of petroleum, including those registered at the climax of World War II.

The oil we have produced is the measure of our stature; the oil we must produce for world recovery is a challenge to our courage.

The present demand situation has fathered a concept of production similar to that which was only recently associated with distance.

Before the age of oil and speed, men spoke of distance as miles to travel, states and countries to pass over. The present convention is to reckon distance in terms of the time consumed in traversing it.

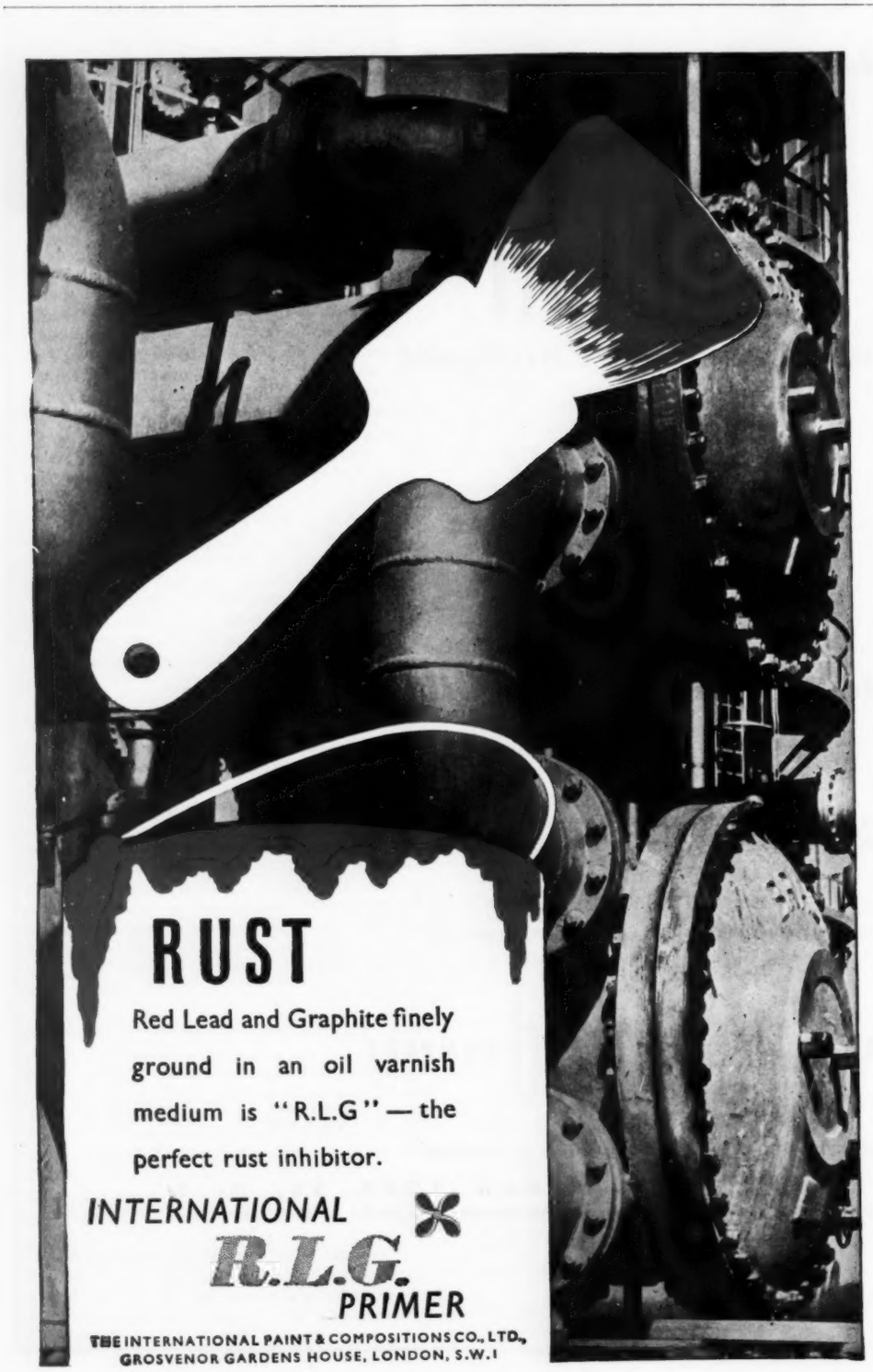
Time and distance are problems of ready solution. Distance no longer has the old meaning. Every day men of science push these frontiers further toward the ultimate. The problem of the day is to achieve human understanding at the same rate.

Production, distance and time are one to the modern man. He doesn't worry how far it is to San Francisco, Toledo or his own home town. How much times does it take? He is the impatient American to whom unnecessary delay doesn't make much sense.

In 1946, the last year of record, American oil companies produced 78.4 percent of the world's petroleum, excluding Russia. When the story is written for 1947, the accomplishments of American oil men will be greater than ever before.

World demand for liquid energy is temporarily running ahead of its immediately available supply. It is not ahead of the industry's knowledge or its ability or its manpower, but it moves with time.

War reverses time; human progress is measured by the ticking of the clock.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J. Frank Wilson

J. FRANK WILSON has been elected vice president of The Standard Oil Co. (Ohio) in charge of crude oil purchasing. He joined the Sohio organization in 1935 after more than 15 years in crude oil procurement activities. Mr. Wilson is president of the Ohio River Pipeline Company, vice president of Owensboro-Ashland Co., vice president of Columbia Pipeline Co., vice president of Sohio Pipeline Co. and a director of Atlas Oil and Refining Co. His headquarters will continue to be in St. Louis.

Perforator Name Change

A change in name from "Perf-Test" to "Shoot-N-Test" has been announced by M. O. Johnston Oil Field Service Corp., Los Angeles, for their mechanically-operated, hydrostatically-fired gun perforator. The change in name has been made to better identify the tool to the oil fraternity who have consistently called for "shooting tests."

New Cycling Plant

Gov. Fielding L. Wright, of Mississippi, after paying tribute to the conservation methods employed by oil companies operating in his state, pressed a switch shutting off flared gas during dedication ceremonies at the new cycling plant at Cranfield, Miss., on Nov. 21, 1947. The plant is the first project of its kind in Mississippi and is being operated by the California Company under a voluntary unitization plan. The California Company has the largest participating interest, most of the remainder being controlled by the Gulf Refining Co. and Placid Oil Co.

Engineers estimate that about 111,000,000 barrels of recoverable petroleum products underlie a productive area of 9500 acres at Cranfield but that without adequate conservation methods, some 15,000,000 barrels of that would never be brought to the surface.

Additional Local Director

Messrs. Hadfields, Ltd., East Hecla Works, Sheffield, England, announced the appointment of four additional local directors on Jan. 1, 1948. They are D. Digby Hawley, manager of the sales department, who has been with the company since 1919; Alec Jack, who was recently appointed London manager after a number of years in the metallurgical and sales departments; Dr. J. R. Rait, research controller, and F. Cousans, foundry controller.

Midget Leak Detector

A leak detector weighing less than two pounds which can be conveniently carried in a pocket has been developed by Fisher Research Laboratory, Inc., Palo Alto, Calif.

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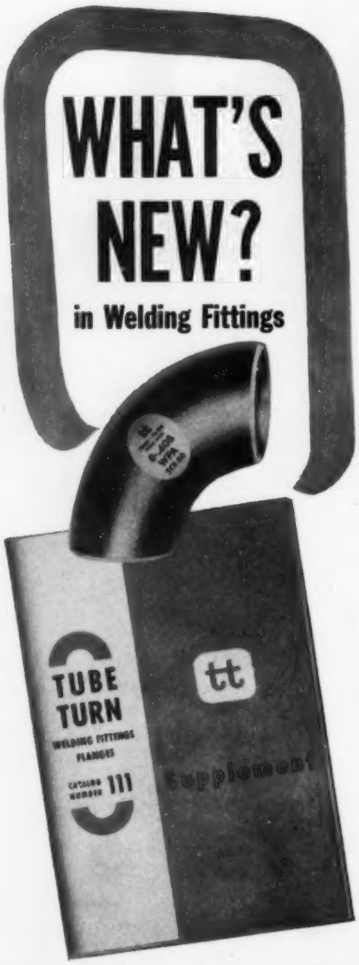

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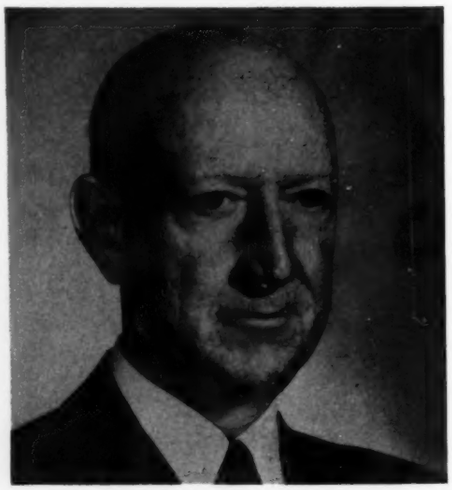
R. L. Minckler

R. L. MINCKLER has been elected president of the General Petroleum Corp., succeeding S. J. Dickey who retired Jan. 1. R. A. Sperry, senior vice president, also retired on that date. Mr. Minckler was elected a vice president in 1945 upon returning from wartime service as director of petroleum supply of the PAW. In June 1947 he was advanced to executive vice president. He joined General Petroleum in 1924; became assistant to the president 10 years later and in 1941 was elected a director. He was for several years a director of the Kettleman North Dome Association.



S. J. Dickey

Mr. Dickey, whom he succeeds, has been president of General Petroleum since 1941. He first joined the company in 1919, was made chief engineer in 1920, a director in 1927 and vice president in charge of manufacture in 1930.

During the first World War, Mr. Dickey was appointed by the Army to direct the development of processes, design and installation of two major plants on the Pacific coast to produce toluene for the production of TNT. This work resulted in the first commercial-scale production of nitration-grade toluene from petroleum and solved an explosives shortage situation developing in this country at that time.

Mr. Sperry is one of the pioneers of General Petroleum and the oil industry, having started work in the Kern River fields in 1901. He joined General Petroleum in 1912, becoming a director in 1925 and a vice president in 1926.

C. G. HERRINGTON of Mattoon, Ill, has been appointed assistant manager of the production department of The Carter Oil Company in the Tulsa headquarters office. K. A. Ackley, Mattoon, was named division manager for the eastern division and also will continue to direct exploration activities in the division, which is composed of Carter operations in Illinois, Michigan, Indiana, Kentucky and Tennessee. O. D. Harper, Mattoon, was appointed production superintendent of the division and will have charge of producing operations in the five-state era.

R. W. HAMLET retired as an assistant treasurer of Socony-Vacuum Oil Co., Inc., on Dec. 1 after more than 37 years of service with the company. George F. Molter, who has been with the company since 1934, succeeds him. Mr. Hamley joined the Standard Oil Co. of New York in the marking department in China and worked in its foreign operations in Istanbul and London.

W. M. HALL has been elected a director of Creole Petroleum Corp. to fill the vacancy left by the resignation of L. F. McCollum. Mr. Hall has been associated with the Standard Oil Co. (N. J.) and its affiliated interests since January, 1921, when he joined the company as a rig builder. After serving in various foreign assignments for 22 years, Mr. Hall came to New York to join the foreign producing department of the Standard Oil Co. (N. J.) In August, 1946, he joined Creole in Venezuela as assistant general manager.

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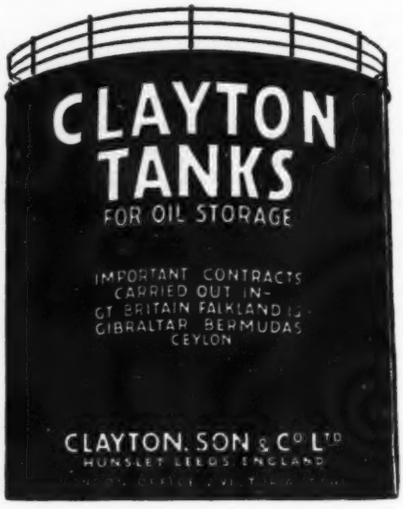

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THE JOHNSTON
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QUICK TO RECOGNIZE the outstanding performance of the JOHNSTON All Purpose GUN PERFORATOR, field men have been constantly calling for "SHOOTING TESTS." So as a tribute to the men who have enthusiastically endorsed this new method of gun perforating and combined perforating and formation testing we have named this operation "SHOOT-N-TEST."
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Jack Podlech

Appointment of Jack Podlech

Jack Podlech has been named assistant to the president and counsel for Oil Base, Inc., Compton, Calif. He was previously with Richfield Oil Co. in land and lease department, and with the Citizen's National Bank of Los Angeles.

Two Years More of Steel Scarcity

Materials for the daily requirements of steel mills of the United States would fill a train 133 miles in length, C. M. White, president of the Republic Steel Corporation, told members of the Pressed Steel Institute on November 24. Talk of adding ten percent, or an additional train 13 miles long, he said, merely indicates that the persons making the proposals do not understand basic conditions. National steel production, in Mr. White's opinion, cannot increase much more than a million tons in 1948, even though plant capacity will have been enlarged by 2,500,000 tons of ingots and 3,000,000 tons of sheet and strip. Limiting factors are the lack of sufficient scrap and coal and possible shortage of gas if the winter is severe.

Despite its difficulties, Mr. White said, the steel industry is currently spending more than a billion dollars for improvement and expansion. Republic alone has commitments of more than $108,000,000. It will be at least two years before much of this expansion can become productive. While output cannot be raised greatly above the 1947 figure of 62 million tons, a survey indicates that demand for the next twelve months will be about 66.5 million tons. Apparently another two years must pass before the demand for steel can be met.

Ice Breakers to Aid Oil Movement

As an aid to the movement of petroleum products, especially fuel oil, to Chicago and points in Illinois, a recommendation has been made to Walter S. Hallanan, chairman of the National Petroleum Council, that authorization be obtained for the use during the coming winter of ice breaking equipment on the Illinois waterway. A special committee appointed on October 10 under the chairmanship of B. L. Majewski reports that a critical supply situation in the Chicago area will result from failure to keep the waterway open to navigation during the winter months and that the light equipment heretofore employed by the carriers is not powerful enough to cope with severe winter conditions. Statistics of freight movement show that coal and oil comprise between 75 and 80 percent of the total tonnage on the Waterway and that petroleum shipments amount to more than 400,000 tons monthly. The committee recommends the assignment to traffic maintenance of four towboats equipped as ice breakers. It recommends that the work be undertaken by the federal government at a cost estimated not to exceed $264,500 and that it be carried out by the Federal Barge Lines, since that organization has the equipment and the legal authority to undertake the operation.

To Double Plant Capacity

A $7,500,000 construction program to expand and modernize its Bakersfield refinery has been planned by Standard of California. New units in the program will include crude distillation and cracking facilities, an office building and laboratory and modern auxiliary equipment.

Capacity of the plant will be increased to a crude run of 20,000 barrels daily, practically double the present capacity. Construction work on the new units is scheduled to start in the spring of 1948 with completion anticipated by mid-1949. Standard's original Bakersfield refinery was built in 1911.

Issues New Bulletin

The method of determining which of the flat-bottom tanks in a vapor-saving system to equip with a lifter-roof and the method of computing the correct sizes of vapor lines connecting the tanks is described in a new 12-page Booklet "C" recently completed by the Chicago Bridge & Iron Company, Chicago 4, Illinois. The vapor pressure of the stored product, the expansion of the air-vapor mixture and the flow of vapor in the vapor lines can be read directly from the charts and tables included in this booklet.

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Angus Cups—the first high-grade Valve and Seating Cups of British manufacture—are now available to Oil Field Engineers. Produced from "Gaco" Fabric composition, an extremely tough and wear-resisting compound, with our famous "Gaco" synthetic rubber as the bonding medium.

Layers of fabric are impregnated with "Gaco" and moulded under heavy pressure to form a tough compact composition capable of resisting the action of abrasion, crude oils and gases at high working pressures and temperatures.

Years of intensive research are behind the development of Angus Cups. Supplied in three hardnesses, sizes as laid down by A.P.I. standards.

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Our "Gaco" synthetic material, which achieved a wide reputation before and during the late war as a medium for hydraulic sealing in aircraft and engineering mechanisms, is also now available for the manufacture of other products used in the Oil Industry.

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AGENTS THROUGHOUT THE WORLD

Pantepec Development Plans

Pantepec Oil Company of Venezuela, C.A., has arranged for a credit of $6,000,000 with The Chase National Bank which will be used in an accelerated program of development of the company's properties in Venezuela. The program includes (1) completion in the Mulata field of a stabilization and repressuring plant now under joint construction with Creole Petroleum Corp. and scheduled for operation about December, 1948; (2) completing preliminary plans for the construction, jointly with Creole, of a stabilization plant to serve the El Roble field, and (3) large-scale drilling operations, currently in progress, in both the Mulata and El Roble fields.

Contracts To Buy Chemicals

Stanolind Oil and Gas Co. has contracted to purchase all the chemical by-products (oxygenated chemicals) to be produced by Carthage Hydrocol, Inc., at its synthetic gasoline plant now under construction at Brownsville, Texas. Stanolind has leased an 85-acre site for the chemical recovery and separation plant adjacent to the Carthage Hydrocol plant, with frontage on the ship channel. Construction of Stanolind's recovery and separation plant will begin shortly after the first of the year.

The refined chemicals to be produced by Stanolind will consist of aliphatic alcohols, aldehydes, acids and ketones having basic use as solvents and as raw materials in many industries, such as those manufacturing rayons, plastics, surface coatings and pharmaceuticals.

Plans New Refinery

Standard Oil Co. of California, will build a $5 million refinery in the Salt Lake City area as the initial step of a long-range refinery program to serve the intermountain region. Capacity will be 25,000 barrels daily. Completion is scheduled within the next twelve months by the Bechtel Corp., builders of the crude distillation unit. Crude will be supplied by pipeline from Rangely, Colorado. Surveys for the projected $5 million line are virtually completed and full-scale construction will be started as soon as weather permits in the spring and pipe is available.

Transportation Club Organized

Latest of the social organizations formed among men having common interests in various branches of the oil industry is the Transportation Club of the Petroleum Industry which had its first annual meeting in Chicago during the API convention in November. Membership of the club will include those engaged in rail, truck, water and air transportation and will be limited to 300 according to present plans.

Officers of the club are A. G. Anderson, Socony-Vacuum Oil Co., president; A. F. Winn, Skelly Oil Company, vice president; A. D. Carlton, Standard Oil Company of California, vice president; R. R. Hooper, Cities Service Company, secretary-treasurer.

Builds New Laboratory

Sun Oil Co. will build a production and geophysical laboratory at Amelia, Texas, which will ultimately bring under a single roof all experimental activities in the Beaumont area. The new plant will contain facilities for building and servicing seismograph equipment as well as for research in exploration and drilling practices. L. G. Ellis will be in charge of the new laboratory.

New Hand Cleaner

To prove how effectively OB hand cleaner removes crude oil, grease, tar, gum, varnish, creosote, printers' ink, Black Magic oil base drilling fluid and almost any substance not soluble in water, Oil Base, Inc., Box 3735 Terminal Annex, Los Angeles 54, Calif., is offering a neatly packaged free sample to all who request one. A small dab rubbed into the hands like ordinary soap and wiped off on a paper towel or rag will remove all traces of dirt and grime from the hands within a few seconds.

Boiler Bulletin

A new bulletin covering engineering details of the Vogt Class LE water tube boilers has been published by Henry Vogt Machine Co., Louisville, Ky. Copies are available on request.

Wayne Names Directors

Following the return of C. E. Franks to America to become executive vice president of the Wayne Pump Company, Fort Wayne, Ind., the management of the Wayne Tank & Pump Co., Ltd., London, will be carried on by R. E. Castle, secretary, and M. J. Crawford, general manager, who have both been appointed directors.

Celebrate 60th Anniversary

Superior engine division of National Supply Co. will celebrate its 60th anniversary in 1948 with a party at the Springfield, Ohio, plant which was founded in 1888 when Ohio was producing a fifth of the world's oil. P. J. Shouvlin who founded the company retired from the board only a year ago. W. F. Tieman, works manager, is chairman of the committee to plan the celebration.

Bureau of Mines Publications

More than 250 Bureau of Mines publications and special articles dealing with the chemistry and refining of petroleum and oil shale are enumerated in a selected list of publications now available for distribution to the petroleum industry. Included are titles of previously published reports on bureau petroleum and oil-shale research during the past 35 years.

A copy of the bibliography titled "A Selected List of Bureau of Mines Publications Dealing with the Chemistry and Refining of Petroleum and Oil Shale," may be obtained by writing to the Bureau of Mines, Department of the Interior, Washington 25, D. C.

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Steam, Diesel or Motor-Driven Pumps, Reciprocal and Centrifugal types, for all refinery duties; Heat Exchangers; Air Compressors; and all power plant auxiliaries for Boiler Feeding and Feed Heating. Write for Catalogue Section IL.8/ "Weir Pumps for the Oil Industry."

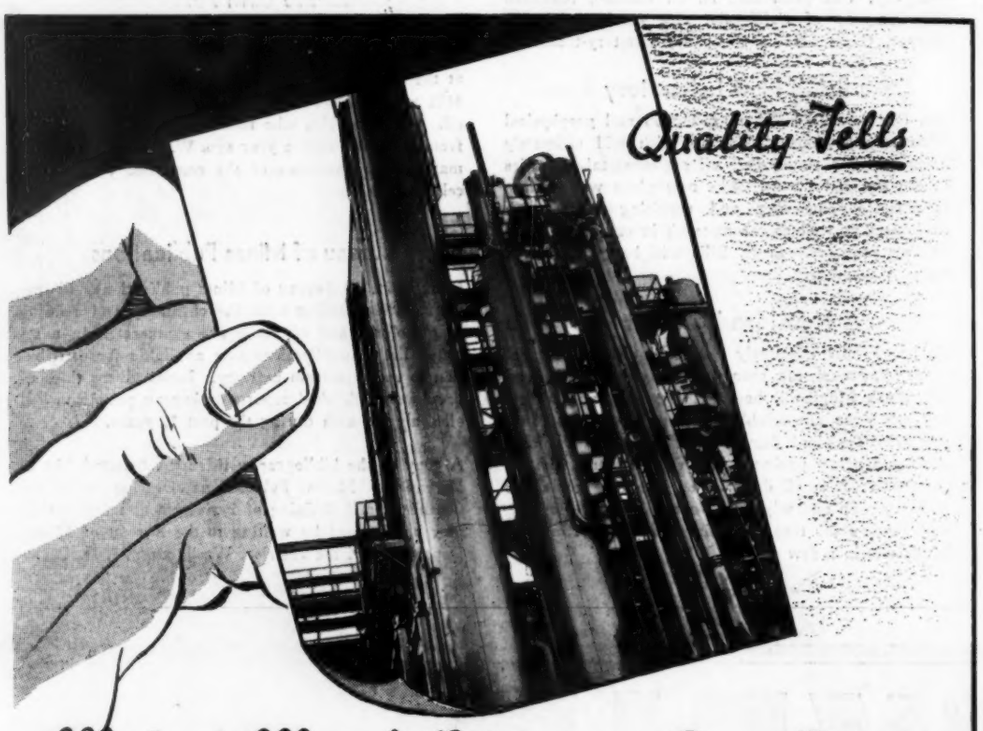
Gas Line for Argentina

Occupying a leading place in President Peron's five-year plan for industrial development of Argentina and scheduled for construction as soon as needed materials and equipment can be obtained is a pipe line 1,100 miles long to convey gas from the Comodoro Rivadavia field to Buenos Aires. A commission representing the recently organized Argentine States Gas Service Department has been traveling in the United States for the past two months, endeavoring to place contracts for pipe and other equipment. The commission is headed by T. M. Tabanera who is accompanied by Juan B. Siri, engineer, and by Abel O. Malvestiti, secretary and business representative. If unsuccessful in placing orders for reasonably early delivery in the United States, the commission will extend its trip to Canada, Switzerland and England.

Brazilian Consumption

Sales of petroleum products in Brazil during 1946 are reported as follows by Foreign Commerce Weekly:

Product	Barrels
Gasoline (inc. aviation)	6,705,683
Kerosene	1,052,794
Diesel oil	1,567,476
Fuel oil	6,250,906
Lubricating oil	419,714
Other	77,021
	16,073,594



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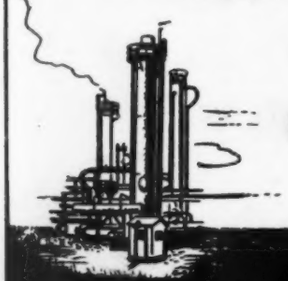


PLEASE SEND INQUIRIES to
PETROLEUM ENGINEERING DEPARTMENT

3301 S. LAMAR DALLAS, TEXAS

BUTANE EQUIPMENT CO., INC.

STORRS J. CASE has been appointed advertising manager of Sun Oil Company. Mr. Case has been in advertising or sales promotion in the automotive field for 24 years. Until recently he owned and operated a tire distributorship at Van Nuys, Calif.

FRANK G. EVANS, formerly with the Shell Oil Company, Inc., is now associated with Carleton D. Speed, Jr., Second National Bank Building, Houston, Texas, in the development of oil properties. During the 20 years Mr. Evans was with Shell, he specialized in field mapping, geologic research and photogeology.

F. H. PAUL has been elected treasurer of California Texas Oil Company, Limited. Mr. Paul has been assistant treasurer since Caltex was founded in 1936.

W. HENRY LINTON has been appointed assistant to Clarence H. Thayer, vice president in charge of been manager of the refinery accounting department since 1942 and has been in the Sun organization since manufacturing, Sun Oil Company. Mr. Linton has 1919.

New Egyptian Fields

A newly-developed oil field in the Dudr district of the Sinai Peninsula, 35 miles south of Suez, is being brought into production by Socony-Vacuum Oil Co. and Anglo-Egyptian Oil Co. Six wells have been drilled so far, of which five are successful producers. It is expected that the initial rate of offtake will be approximately 5,000 barrels daily.

Pacific Pumps In England

The Pulsometer Engineering Co., Ltd., Reading, England, recently completed an agreement with Pacific Pumps, Inc., of Huntington Park, Calif., under which they have the sole British rights to manufacture the complete range of pumps which Pacific Pumps, Inc., have supplied for many years for oil refineries and oil field services. Pumps and spare parts made at Reading will be interchangeable in every detail with those made in the States.

To Address Canadian Surveyors

Virgil Kauffman, president of Aero Service Corp., Philadelphia, will speak at the annual meeting of Canadian Institute of Surveying at Ottawa on Feb. 4 and 5. His subject will be "The Airborne Magnetometer." In January, 1947, Aero Service pioneered the first commercial airborne magnetometer survey after several years of experimental work. It was a study made in Canada for a mining company. Since that time the company has made numerous other surveys for ore and oil, the largest oil survey being a regional study of the Bahamas for five major oil companies.

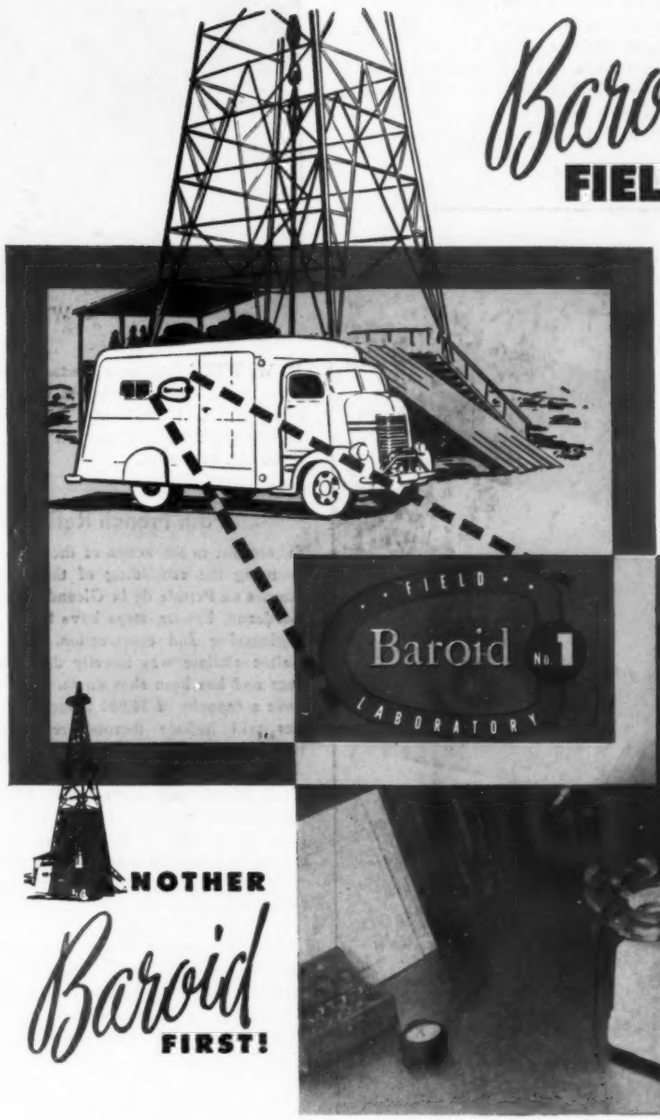
New Line of Swing Check Valves

Crane Co. has introduced new lines of corrosion-resistant swing-check valves in sizes one-half to six inches. The 2½ to 6-inch valves can be furnished with outside lever and weight, which can be applied either to assist the disc in closing, making the valve extremely sensitive to reversal of flow, or to balance the disc, causing the valve to open under a minimum of pressure. The valves are recommended for liquid or gas working pressures up to 150 pounds and for a maximum temperature of 350°F.

Oil Base, Inc., Moves To New Plant

Oil Base, Inc., has moved head offices from Los Angeles to the new plant in Compton, California, where all facilities have been combined on a newly-acquired 4½-acre site, for the complete manufacture, packaging, mixing and shipping of Black Magic oil base drillng fluid.

Baroid
FIELD LABORATORIES
SOLVE TIME PROBLEM



ANOTHER
Baroid
FIRST!

TIME changes all things—particularly mud and core samples. Baroid laboratory technicians, acutely conscious of these changes, now have a new method that enables them to reduce the time factor substantially. Mobile laboratories, housed in trucks, manned by carefully trained personnel and containing complete mud analysis equipment, now take Baroid laboratories to the field.

Too often, in the past, transportation delays would result in vital chemical and physical changes to specimens being sent to Baroid laboratories from the field. These prevented or seriously affected a true interpretation of conditions.

Baroid's new field laboratory reduces this lost-time factor to a minimum. Now, prompt tests will render more valuable data to Baroid chemists and engineers. The new mobile laboratories will also serve as a training ground to acquaint laboratory technicians with field problems. Thus closer cooperation between laboratory and field personnel will result in improved service.

The new Baroid field laboratories in no way will take the place of Baroid field service engineers. The new mobile units merely extend Baroid laboratories to the field. Baroid field engineers will continue to make routine mud analyses and to recommend field procedure in every active drilling area.

BAROID SALES DIVISION ● **NATIONAL LEAD COMPANY**
LOS ANGELES 12 • TULSA 3 • HOUSTON 2

New Rubbers Test Well

Two new types of synthetic rubber, Philprene A, which is superior for tire treads to natural rubber as well as to the synthetic rubbers now being produced, and Philprene B, which promises to be a replacement for natural rubber in tire carcasses, are being produced on pilot plant scale by Phillips Petroleum. The new rubber is a butadiene-styrene coplymer and is manufactured in water emulsions at temperatures considerably lower than used in making present-day synthetic rubber.

Tire and mechanical goods manufacturers who have been supplied with experimental quantities of Philprene A report superior wear and resistance to cracking and experimental tire treads tested on Phillips cars and show exceptional wearing qualities. Chief advantages of Philprene B are high tensile strength, resistance to cracking, and low heat build-up. Its principal application is expected to be in tire carcasses.

Kehde Joins Foster Wheeler

Howard Kehde, formerly of Union Oil Co. of Calif., is now in charge of process engineering of Hypersorption units for Foster Wheeler Corp. Mr. Kehde had spent over four years with Union Oil Co. in their process development division where he assisted Dr. Clyde Berg in development of all phases of the Hypersorption Process since its inception. He also assisted in the direction of the start-up operations of the first commercial hypersorption unit, which went on stream last May.

R. W. Wire

R. W. WIRE has been elected president and general manager of Loffland Brothers Company, Tulsa, Okla., effective Jan. 1, 1948. Mr. Wire was formerly sales manager of the southwestern area for the National Tube Co. at Dallas.

Push French Refinery Work

Subsequent to the action of the French Government in licensing the rebuilding of the refinery of the Raffineries de Petrole de la Gironde at Bec d'Ambes, near Bordeaux, France, steps have been taken to speed the engineering and construction. The refinery of this Caltex affiliate was heavily damaged by war bombings and has been shut down. The new refinery will have a capacity of 14,000 barrels per day. The facilities will include thermal reforming and chemical treating when reconstruction is completed in 1950.

G. H. Zarafanetis of Arthur G. McKee and Co. construction contractors, has gone to France as construction superintendent. E. L. Howard, Caltex design engineer, has been in France since October, purchasing materials and supervising on the ground design of facilities.

This is the second recent announcement of refinery construction by Caltex affiliates in Europe. Two months ago, announcement was made of the start of construction of a 22,500 barrel refinery near Rotterdam, Holland, by Caltex Petroleum Maatschappij (Nederland(...V., which will cost approximately $19 million and is scheduled for completion about the early part of 1950. The Caltex construction engineer in charge of the Holland project is F. W. Regan.

New Cooper-Bessemer Engine

Cooper-Bessemer Corp., of Mount Vernon, Ohio, has developed a new design in large two-cycle gas engines which will be in full production in the second quarter of 1948. The new "Turboflo" engines develop 10 percent more horsepower than is possible from present engines of the same size and fuel consumption is reduced 15 percent under that of any two-cycle gas-burning engine ever built it is claimed.

The "Turboflo" uses a combination of combustion principles that have not before been used in this type of engine. The changes worked out along the line of getting a greater volume of air and gas mixture into a more intimate relationship and then igniting it electrically at a greatly increased voltage through a standard spark plug. The engine has been thoroughly tested in the company's research division and one of which has been operating in an actual installation for more than a year with a fuel consumption of 8500 Btu's per horsepower per hour. The previous standard guarantee for two-cycle engines in this type of service has been 10,000 Btu's per horsepower per hour.

FRANK E. BROWN
President

FRANK B. SMITH
Secy.-Treas.

R. P. (Jack) GREEN
Vice-President

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